

Article

# Methodology for Determining the Maximum Potentially Recoverable Energy in Water Distribution Networks

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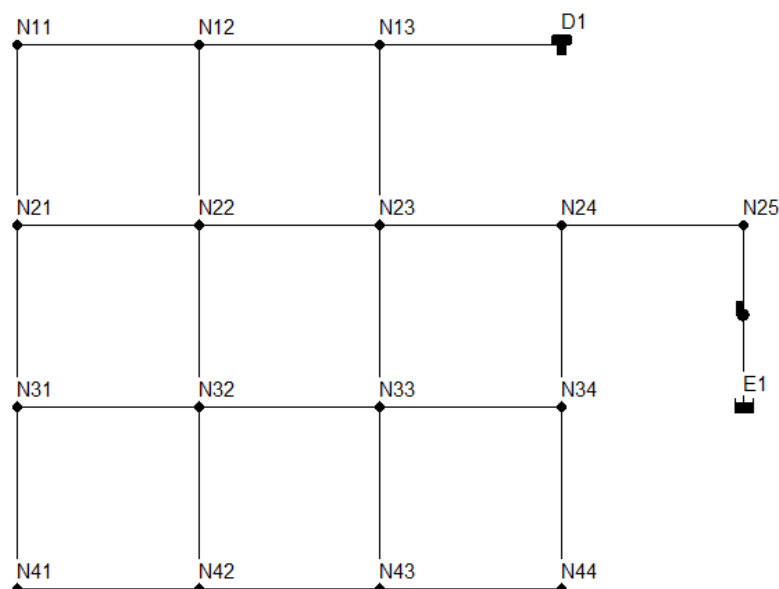
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## Supplementary materials

### Networks data

#### Example network

The example analysis network for the development of the methodology corresponds to a network with 16 junctions, 24 pipes, 1 tank and 1 pump station. The diameters of the network range from 50–250 mm. The following figure shows the studied network.



**Figure 1.** Mathematical model. Example network.

The data of the original example network is presented below:

[TITLE]

[JUNCTIONS]

| ;ID | Elev | Demand | Pattern |
|-----|------|--------|---------|
| N25 | 5    | 0.00   | ;       |
| N11 | 19   | 1.25   | ;       |
| N12 | 20   | 1.50   | ;       |
| N13 | 26   | 2.25   | ;       |
| N21 | 10   | 1.50   | ;       |
| N22 | 11   | 3.75   | ;       |
| N23 | 12   | 1.50   | ;       |
| N31 | 9    | 3.00   | ;       |
| N32 | 10   | 2.25   | ;       |
| N33 | 11   | 1      | ;       |
| N24 | 13   | 4.50   | ;       |
| N34 | 12   | 2.25   | ;       |
| N41 | 0    | 2.75   | ;       |
| N42 | 7    | 3.00   | ;       |
| N43 | 12   | 2.25   | ;       |
| N44 | 19   | 3.75   | ;       |

[RESERVOIRS]

| ;ID | Head | Pattern |
|-----|------|---------|
| E1  | 5    | ;       |

[TANKS]

| ;ID | Elevation | InitLevel | MinLevel | MaxLevel | Diameter | MinVol | VolCurve |
|-----|-----------|-----------|----------|----------|----------|--------|----------|
| D1  | 55        | 3.5       | 1        | 4        | 10       | 0      | ;        |

[PIPES]

| ;ID  | Node1 | Node2 | Length | Diameter | Roughness | MinorLoss | Status |
|------|-------|-------|--------|----------|-----------|-----------|--------|
| L25  | N25   | N24   | 1000   | 250      | 0.1       | 0         | Open ; |
| L11  | N11   | N12   | 500    | 100      | 0.1       | 0         | Open ; |
| L12  | N12   | N13   | 500    | 100      | 0.1       | 0         | Open ; |
| L21  | N21   | N22   | 500    | 125      | 0.1       | 0         | Open ; |
| L22  | N22   | N23   | 500    | 125      | 0.1       | 0         | Open ; |
| L31  | N31   | N32   | 500    | 50       | 0.1       | 0         | Open ; |
| L111 | N11   | N21   | 500    | 100      | 0.1       | 0         | Open ; |
| L112 | N12   | N22   | 500    | 75       | 0.1       | 0         | Open ; |
| L113 | N13   | N23   | 500    | 200      | 0.1       | 0         | Open ; |
| L121 | N21   | N31   | 500    | 100      | 0.1       | 0         | Open ; |
| L122 | N22   | N32   | 500    | 75       | 0.1       | 0         | Open ; |

|      |     |     |     |     |     |   |        |
|------|-----|-----|-----|-----|-----|---|--------|
| L123 | N23 | N33 | 500 | 100 | 0.1 | 0 | Open ; |
| L32  | N32 | N33 | 500 | 50  | 0.1 | 0 | Open ; |
| L13  | N13 | D1  | 500 | 200 | 0.1 | 0 | Open ; |
| L23  | N23 | N24 | 500 | 200 | 0.1 | 0 | Open ; |
| L33  | N33 | N34 | 500 | 50  | 0.1 | 0 | Open ; |
| L124 | N24 | N34 | 500 | 100 | 0.1 | 0 | Open ; |
| L131 | N31 | N41 | 500 | 50  | 0.1 | 0 | Open ; |
| L41  | N41 | N42 | 500 | 50  | 0.1 | 0 | Open ; |
| L42  | N42 | N43 | 500 | 50  | 0.1 | 0 | Open ; |
| L43  | N43 | N44 | 500 | 50  | 0.1 | 0 | Open ; |
| L132 | N32 | N42 | 500 | 75  | 0.1 | 0 | Open ; |
| L133 | N33 | N43 | 500 | 100 | 0.1 | 0 | Open ; |
| L134 | N34 | N44 | 500 | 75  | 0.1 | 0 | Open ; |

## [PUMPS]

| ;ID | Node1 | Node2 | Parameters |
|-----|-------|-------|------------|
| B1  | E1    | N25   | HEAD C1 ;  |

## [VALVES]

| ;ID | Node1 | Node2 | Diameter | Type | Setting | MinorLoss |
|-----|-------|-------|----------|------|---------|-----------|
|-----|-------|-------|----------|------|---------|-----------|

## [TAGS]

## [DEMANDS]

| ;junction | Demand | Pattern | Category |
|-----------|--------|---------|----------|
|-----------|--------|---------|----------|

## [STATUS]

| ;ID | Status/Setting |
|-----|----------------|
|-----|----------------|

## [PATTERNS]

| ;ID | Multipliers |
|-----|-------------|
|-----|-------------|

## [CURVES]

| ;ID     | X-Value | Y-Value |
|---------|---------|---------|
| ;BOMBA: |         |         |
| C1      | 0       | 120     |
| C1      | 30      | 110     |
| C1      | 70      | 30      |

## [CONTROLS]

## [RULES]

## [ENERGY]

|                   |    |
|-------------------|----|
| Global Efficiency | 75 |
| Global Price      | 0  |
| Demand Charge     | 0  |

## [EMITTERS]

|           |             |
|-----------|-------------|
| ;Junction | Coefficient |
|-----------|-------------|

## [QUALITY]

|       |          |
|-------|----------|
| ;Node | InitQual |
| E1    | 100      |
| D1    | 100      |

## [SOURCES]

|       |      |         |         |
|-------|------|---------|---------|
| ;Node | Type | Quality | Pattern |
|-------|------|---------|---------|

## [REACTIONS]

|       |           |             |
|-------|-----------|-------------|
| ;Type | Pipe/Tank | Coefficient |
|-------|-----------|-------------|

## [REACTIONS]

|                       |   |
|-----------------------|---|
| Order Bulk            | 1 |
| Order Tank            | 1 |
| Order Wall            | 1 |
| Global Bulk           | 0 |
| Global Wall           | 0 |
| Limiting Potential    | 0 |
| Roughness Correlation | 0 |

## [MIXING]

|       |       |
|-------|-------|
| ;Tank | Model |
|-------|-------|

## [TIMES]

|                    |          |
|--------------------|----------|
| Duration           | 0:00     |
| Hydraulic Timestep | 1:00     |
| Quality Timestep   | 0:05     |
| Pattern Timestep   | 1:00     |
| Pattern Start      | 0:00     |
| Report Timestep    | 1:00     |
| Report Start       | 0:00     |
| Start ClockTime    | 12:00 AM |
| Statistic          | NONE     |

## [REPORT]

|         |    |
|---------|----|
| Status  | No |
| Summary | No |
| Page    | 0  |

## [OPTIONS]

|                   |             |
|-------------------|-------------|
| Units             | LPS         |
| Headloss          | D-W         |
| Specific Gravity  | 1           |
| Viscosity         | 1           |
| Trials            | 40          |
| Accuracy          | 0.001       |
| CHECKFREQ         | 2           |
| MAXCHECK          | 10          |
| DAMPLIMIT         | 0           |
| Unbalanced        | Continue 10 |
| Pattern           | 1           |
| Demand Multiplier | 1.4         |
| Emitter Exponent  | 1.2         |
| Quality           | None mg/L   |
| Diffusivity       | 1           |
| Tolerance         | 0.01        |

## [COORDINATES]

| ;Node | X-Coord  | Y-Coord |
|-------|----------|---------|
| N25   | 12000.00 | 6000.00 |
| N11   | 4000.00  | 8000.00 |
| N12   | 6000.00  | 8000.00 |
| N13   | 8000.00  | 8000.00 |
| N21   | 4000.00  | 6000.00 |
| N22   | 6000.00  | 6000.00 |
| N23   | 8000.00  | 6000.00 |
| N31   | 4000.00  | 4000.00 |
| N32   | 6000.00  | 4000.00 |
| N33   | 8000.00  | 4000.00 |
| N24   | 10000.00 | 6000.00 |
| N34   | 10000.00 | 4000.00 |
| N41   | 4000.00  | 2000.00 |
| N42   | 6000.00  | 2000.00 |
| N43   | 8000.00  | 2000.00 |
| N44   | 10000.00 | 2000.00 |
| E1    | 12000.00 | 4000.00 |

D1                      10000.00    8000.00

[VERTICES]

;Link                X-Coord   Y-Coord

;X-Coord           Y-Coord   Label & Anchor Node

[BACKDROP]

DIMENSIONS   3000.00    1000.00   15000.00   10000.00

UNITS           Ninguno

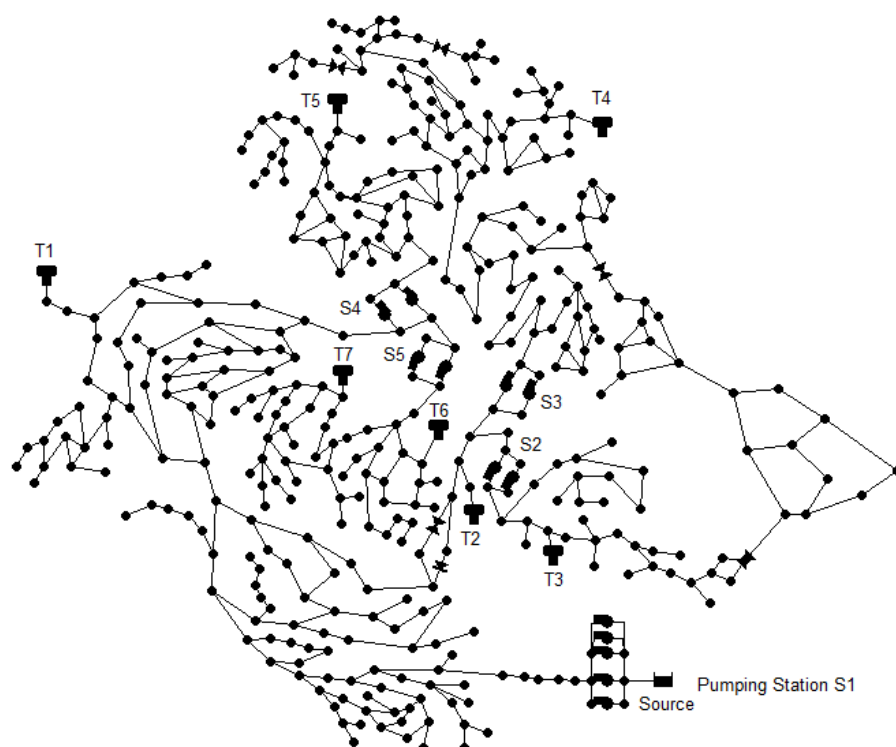
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OFFSET         0.00           0.00

[END]

#### Study case - C-Town network

This study case corresponds to the C-Town network presented by Ostfeld et al. [1] and optimized by Iglesias-Rey et al. [2]. For the C-Town network the simple programmed controls were omitted in the simulation model. This network contains 399 junctions, 462 pipes, 1 reservoir, 7 tank and 13 pumps. The diameters of the network vary between 51–711 mm. The following figure shows the studied network.



**Figure 2.** Mathematical model. C-Town Network.

The data of the original example network is presented below:

[TITLE]

Red inicial completa

Actualización: 06-07-2012

[JUNCTIONS]

| ID    | Elev   | Demand      | Pattern    |
|-------|--------|-------------|------------|
| J511  | 105.08 | 1.763868462 | DMA2_pat ; |
| J411  | 8.95   | 1.33356     | DMA1_pat ; |
| J414  | 34.36  | 1.448796923 | DMA1_pat ; |
| J415  | 65     | 0           | ;          |
| J416  | 42.6   | 0           | ;          |
| J417  | 37.38  | 1.936849615 | DMA1_pat ; |
| J418  | 37.39  | 0           | ;          |
| J419  | 40.5   | 0           | ;          |
| J310  | 51.84  | 2.036224615 | DMA4_pat ; |
| J311  | 55.95  | 1.772595    | DMA4_pat ; |
| J312  | 68.48  | 0.113381538 | DMA4_pat ; |
| J313  | 67.66  | 1.035083077 | DMA4_pat ; |
| J314  | 14.94  | 2.156548846 | DMA1_pat ; |
| J315  | 16.03  | 1.976200385 | DMA1_pat ; |
| J316  | 12.98  | 0.93384     | DMA1_pat ; |
| J318  | 53.67  | 2.404883077 | DMA4_pat ; |
| J319  | 39.29  | 2.178615    | DMA4_pat ; |
| J210  | 7.01   | 0.692307692 | DMA1_pat ; |
| J211  | 11.27  | 2.373893077 | DMA1_pat ; |
| J212  | 7.87   | 0.910046538 | DMA1_pat ; |
| J214  | 8.67   | 1.312171154 | DMA1_pat ; |
| J217  | 10.98  | 1.91778     | DMA1_pat ; |
| J218  | 7.68   | 0.133760769 | DMA1_pat ; |
| J219  | 52     | 1.481145    | DMA5_pat ; |
| J110  | 15.92  | 1.171750385 | DMA1_pat ; |
| J420  | 39.99  | 0           | ;          |
| J421  | 37.09  | 1.556741538 | DMA1_pat ; |
| J422  | 38.81  | 0           | ;          |
| J1153 | 22.14  | 0.659483077 | DMA1_pat ; |
| J1154 | 14.61  | 0.698355    | DMA1_pat ; |
| J1155 | 15.54  | 2.074504615 | DMA1_pat ; |
| J425  | 64.42  | 0           | ;          |
| J426  | 72.71  | 0           | ;          |
| J1157 | 22.21  | 2.465233846 | DMA1_pat ; |
| J427  | 67.65  | 0           | ;          |

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|       |       |             |            |
|-------|-------|-------------|------------|
| J1158 | 28.25 | 0.567165    | DMA1_pat ; |
| J428  | 16.2  | 1.737789231 | DMA1_pat ; |
| J429  | 12.56 | 2.450008846 | DMA1_pat ; |
| J320  | 46.73 | 0.609828462 | DMA4_pat ; |
| J321  | 44.59 | 1.334681538 | DMA4_pat ; |
| J322  | 48.02 | 0.265924615 | DMA4_pat ; |
| J324  | 42.38 | 2.498536154 | DMA4_pat ; |
| J1056 | 7.64  | 1.69044     | DMA1_pat ; |
| J327  | 49.68 | 0.039259615 | DMA4_pat ; |
| J1058 | 13.58 | 1.43796     | DMA1_pat ; |
| J328  | 45.69 | 0.250130769 | DMA4_pat ; |
| J329  | 44.05 | 0.257556923 | DMA4_pat ; |
| J220  | 60    | 1.997210769 | DMA5_pat ; |
| J221  | 77.07 | 0.711200769 | DMA4_pat ; |
| J225  | 13.33 | 0.114123462 | DMA1_pat ; |
| J226  | 11.1  | 0.739431923 | DMA1_pat ; |
| J50   | 71.8  | 0.955025769 | DMA4_pat ; |
| J51   | 72.42 | 0.752426538 | DMA4_pat ; |
| J53   | 80    | 2.371428462 | DMA5_pat ; |
| J54   | 80    | 2.449573846 | DMA5_pat ; |
| J128  | 85.26 | 1.003435385 | DMA2_pat ; |
| J55   | 71    | 0.6957      | DMA5_pat ; |
| J129  | 62.85 | 0.401103462 | DMA2_pat ; |
| J56   | 72    | 0.407053846 | DMA5_pat ; |
| J57   | 59    | 1.616466923 | DMA5_pat ; |
| J58   | 76    | 1.025183077 | DMA5_pat ; |
| J59   | 57    | 1.031918077 | DMA5_pat ; |
| J1160 | 24.91 | 1.781825769 | DMA1_pat ; |
| J1161 | 25.25 | 0.815515385 | DMA1_pat ; |
| J431  | 16.9  | 1.582946538 | DMA1_pat ; |
| J432  | 19.88 | 0.518903077 | DMA1_pat ; |
| J433  | 27.35 | 0.465033462 | DMA1_pat ; |
| J434  | 16.48 | 1.458398077 | DMA1_pat ; |
| J435  | 12.15 | 0.201786923 | DMA1_pat ; |
| J436  | 17.68 | 1.144929231 | DMA1_pat ; |
| J438  | 10.43 | 2.264325    | DMA1_pat ; |
| J1169 | 55.42 | 0.653420769 | DMA3_pat ; |
| J439  | 17.78 | 1.963030385 | DMA1_pat ; |
| J330  | 58.25 | 0.947255769 | DMA4_pat ; |
| J331  | 59.26 | 0.724163077 | DMA4_pat ; |
| J332  | 36    | 1.986       | DMA1_pat ; |
| J333  | 25.7  | 1.579355769 | DMA1_pat ; |

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|       |       |             |            |
|-------|-------|-------------|------------|
| J334  | 29.28 | 1.569105    | DMA1_pat ; |
| J335  | 25.08 | 1.071140769 | DMA1_pat ; |
| J336  | 23.81 | 0.244935    | DMA1_pat ; |
| J337  | 22.11 | 1.402600385 | DMA1_pat ; |
| J231  | 71.9  | 1.736214231 | DMA4_pat ; |
| J232  | 69.81 | 2.284294615 | DMA4_pat ; |
| J233  | 74.23 | 0           | ;          |
| J234  | 64.06 | 0.045       | DMA2_pat ; |
| J236  | 58    | 1.358401154 | DMA5_pat ; |
| J237  | 73.14 | 2.29041     | DMA5_pat ; |
| J130  | 54.52 | 1.075653462 | DMA2_pat ; |
| J131  | 88.05 | 1.694869615 | DMA2_pat ; |
| J132  | 74.55 | 1.256134615 | DMA2_pat ; |
| J133  | 69.58 | 1.284343846 | DMA2_pat ; |
| J60   | 55    | 1.157449615 | DMA5_pat ; |
| J134  | 80.7  | 0.883681154 | DMA2_pat ; |
| J135  | 70    | 1.012085769 | DMA2_pat ; |
| J62   | 60    | 0.674329615 | DMA5_pat ; |
| J64   | 80    | 0.138984231 | DMA5_pat ; |
| J65   | 80    | 0.609613846 | DMA5_pat ; |
| J66   | 72    | 2.447695385 | DMA5_pat ; |
| J67   | 79    | 0.152290385 | DMA5_pat ; |
| J68   | 73    | 0.975729231 | DMA5_pat ; |
| J69   | 71    | 0.912488077 | DMA5_pat ; |
| J1170 | 54.54 | 1.224736154 | DMA3_pat ; |
| J441  | 69    | 0           | ;          |
| J444  | 29.46 | 1.186148077 | DMA1_pat ; |
| J341  | 14.89 | 0.643168846 | DMA1_pat ; |
| J344  | 54.7  | 1.57188     | DMA3_pat ; |
| J345  | 49.97 | 1.355175    | DMA3_pat ; |
| J347  | 54.4  | 0.390755769 | DMA3_pat ; |
| J348  | 62.18 | 2.346363462 | DMA4_pat ; |
| J349  | 36.41 | 1.636248462 | DMA4_pat ; |
| J241  | 70    | 1.265218846 | DMA5_pat ; |
| J242  | 65    | 0.976179231 | DMA5_pat ; |
| J243  | 60    | 0.268438846 | DMA5_pat ; |
| J244  | 70    | 1.959988846 | DMA5_pat ; |
| J245  | 71    | 1.149101538 | DMA5_pat ; |
| J246  | 55    | 1.884220385 | DMA5_pat ; |
| J247  | 57    | 1.490236154 | DMA5_pat ; |
| J248  | 54    | 2.081825769 | DMA5_pat ; |
| J249  | 50    | 0.046895769 | DMA5_pat ; |

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|      |       |             |            |
|------|-------|-------------|------------|
| J142 | 5.53  | 0.525921923 | DMA1_pat ; |
| J143 | 6.3   | 0.184883077 | DMA1_pat ; |
| J70  | 70    | 0.263633077 | DMA5_pat ; |
| J144 | 4.17  | 0.829235769 | DMA1_pat ; |
| J71  | 77    | 0.320625    | DMA5_pat ; |
| J72  | 75    | 0.000603462 | DMA5_pat ; |
| J73  | 80    | 1.341985385 | DMA5_pat ; |
| J74  | 75    | 1.642638462 | DMA5_pat ; |
| J76  | 70    | 1.360035    | DMA5_pat ; |
| J77  | 76    | 2.06853     | DMA5_pat ; |
| J78  | 60.56 | 0.204733846 | DMA4_pat ; |
| J350 | 33.82 | 0.479806154 | DMA3_pat ; |
| J351 | 25.51 | 1.697283462 | DMA4_pat ; |
| J352 | 47.55 | 1.135519615 | DMA4_pat ; |
| J353 | 22.64 | 0.892558846 | DMA4_pat ; |
| J354 | 18.68 | 0.374951538 | DMA4_pat ; |
| J355 | 28.87 | 1.760989615 | DMA4_pat ; |
| J358 | 22.3  | 2.321965385 | DMA4_pat ; |
| J359 | 17.57 | 1.325530385 | DMA4_pat ; |
| J250 | 67    | 0.224103462 | DMA5_pat ; |
| J251 | 75.19 | 1.894323462 | DMA2_pat ; |
| J252 | 83.82 | 1.004605385 | DMA2_pat ; |
| J253 | 74.69 | 1.154686154 | DMA2_pat ; |
| J254 | 74.59 | 1.230414231 | DMA2_pat ; |
| J257 | 80    | 0.519069231 | DMA2_pat ; |
| J154 | 43.69 | 0.82434     | DMA1_pat ; |
| J155 | 44.41 | 0.238572692 | DMA1_pat ; |
| J82  | 70.87 | 1.474481538 | DMA4_pat ; |
| J156 | 46.16 | 0.424683462 | DMA1_pat ; |
| J83  | 61.07 | 2.319041538 | DMA4_pat ; |
| J84  | 43.82 | 0.244824231 | DMA5_pat ; |
| J85  | 45    | 1.109656154 | DMA5_pat ; |
| J159 | 37.41 | 0.682367308 | DMA1_pat ; |
| J86  | 50    | 2.181366923 | DMA5_pat ; |
| J87  | 42.63 | 1.876719231 | DMA5_pat ; |
| J89  | 68.29 | 0.682355769 | DMA2_pat ; |
| J360 | 20.71 | 1.684118077 | DMA4_pat ; |
| J361 | 26.67 | 0.641571923 | DMA4_pat ; |
| J362 | 43.66 | 0.224741538 | DMA4_pat ; |
| J363 | 72.23 | 0           | ;          |
| J364 | 65    | 0           | ;          |
| J365 | 29.83 | 1.975323462 | DMA1_pat ; |

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|       |        |             |            |
|-------|--------|-------------|------------|
| J366  | 14.46  | 0.743145    | DMA1_pat ; |
| J1208 | 42.74  | 0.588205385 | DMA4_pat ; |
| J367  | 13.6   | 1.201186154 | DMA1_pat ; |
| J369  | 20.27  | 0.636504231 | DMA1_pat ; |
| J160  | 43.69  | 0.851516538 | DMA1_pat ; |
| J161  | 22.81  | 0.112335    | DMA1_pat ; |
| J162  | 36.88  | 1.206070385 | DMA1_pat ; |
| J163  | 16.2   | 0.515043462 | DMA1_pat ; |
| J164  | 17.34  | 2.161336154 | DMA1_pat ; |
| J91   | 64.09  | 1.471571538 | DMA2_pat ; |
| J165  | 16.69  | 1.887271154 | DMA1_pat ; |
| J166  | 23.95  | 2.319708462 | DMA1_pat ; |
| J167  | 23.91  | 0.827541923 | DMA1_pat ; |
| J94   | 30.75  | 1.357353462 | DMA3_pat ; |
| J95   | 22.56  | 0.201728077 | DMA1_pat ; |
| J96   | 30     | 1.585930385 | DMA1_pat ; |
| J97   | 34.19  | 1.025091923 | DMA1_pat ; |
| J976  | 6.3    | 2.401058077 | DMA1_pat ; |
| J571  | 77.11  | 0.286558846 | DMA2_pat ; |
| J572  | 76.4   | 2.308613077 | DMA2_pat ; |
| J573  | 81.62  | 1.550524615 | DMA2_pat ; |
| J574  | 67.36  | 0.869315769 | DMA2_pat ; |
| J575  | 75.27  | 0.373114615 | DMA2_pat ; |
| J576  | 80.8   | 1.199945769 | DMA2_pat ; |
| J370  | 20.46  | 0.548523462 | DMA1_pat ; |
| J371  | 68.81  | 0           | ;          |
| J372  | 23.2   | 0.326051538 | DMA1_pat ; |
| J373  | 27.22  | 0.072214615 | DMA1_pat ; |
| J374  | 13.7   | 0.863479615 | DMA1_pat ; |
| J375  | 22.72  | 1.369171154 | DMA1_pat ; |
| J376  | 12.18  | 2.307386538 | DMA1_pat ; |
| J377  | 13.12  | 1.345615385 | DMA1_pat ; |
| J1219 | 14.48  | 1.016053846 | DMA1_pat ; |
| J379  | 10.25  | 2.118114231 | DMA1_pat ; |
| J171  | 8.81   | 2.065564615 | DMA1_pat ; |
| J172  | 6.25   | 1.681069615 | DMA1_pat ; |
| J173  | 13     | 1.804736538 | DMA1_pat ; |
| J174  | 6.11   | 2.491929231 | DMA1_pat ; |
| J175  | 6.84   | 0.849514615 | DMA1_pat ; |
| J177  | 13.14  | 1.238028462 | DMA1_pat ; |
| J179  | 15.01  | 1.03242     | DMA1_pat ; |
| J580  | 105.08 | 1.738204615 | DMA2_pat ; |

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|       |        |             |            |
|-------|--------|-------------|------------|
| J486  | 86.11  | 0.447723462 | DMA2_pat ; |
| J487  | 79     | 1.057295769 | DMA2_pat ; |
| J488  | 89.16  | 1.357943077 | DMA2_pat ; |
| J489  | 85.02  | 2.036659615 | DMA2_pat ; |
| J381  | 36.02  | 1.352284615 | DMA4_pat ; |
| J1223 | 3.48   | 1.068833077 | DMA1_pat ; |
| J382  | 70.42  | 1.272670385 | DMA4_pat ; |
| J384  | 42.51  | 0           | ;          |
| J385  | 76.6   | 0           | ;          |
| J180  | 8.77   | 1.224575769 | DMA1_pat ; |
| J181  | 10.94  | 1.702048846 | DMA1_pat ; |
| J1024 | 5.83   | 2.216500385 | DMA1_pat ; |
| J183  | 13.28  | 0.926288077 | DMA1_pat ; |
| J1025 | 8.61   | 0.756243462 | DMA1_pat ; |
| J186  | 9.38   | 0.732167308 | DMA1_pat ; |
| J187  | 9.81   | 0.375778846 | DMA1_pat ; |
| J188  | 8.51   | 1.324553077 | DMA1_pat ; |
| J189  | 7.58   | 0.558154615 | DMA1_pat ; |
| J490  | 95.84  | 1.461324231 | DMA2_pat ; |
| J491  | 76.93  | 0.908646923 | DMA2_pat ; |
| J492  | 94.67  | 2.189936538 | DMA2_pat ; |
| J493  | 77.62  | 1.195035    | DMA2_pat ; |
| J494  | 93.76  | 0.476583462 | DMA2_pat ; |
| J495  | 91.15  | 1.710155769 | DMA2_pat ; |
| J496  | 91     | 1.868539615 | DMA2_pat ; |
| J497  | 105.63 | 1.534836923 | DMA2_pat ; |
| J498  | 90.12  | 1.955348077 | DMA2_pat ; |
| J500  | 75.52  | 0.404359615 | DMA2_pat ; |
| J499  | 72.24  | 2.01945     | DMA2_pat ; |
| J501  | 80.97  | 0.506545385 | DMA2_pat ; |
| J502  | 80.99  | 2.391905769 | DMA2_pat ; |
| J503  | 99.65  | 0.164628462 | DMA2_pat ; |
| J504  | 66.71  | 0.153805385 | DMA2_pat ; |
| J394  | 70.53  | 0.346153846 | DMA2_pat ; |
| J509  | 99.94  | 0.949013077 | DMA2_pat ; |
| J399  | 75     | 0           | ;          |
| J401  | 70     | 0           | ;          |
| J406  | 71.74  | 0           | ;          |
| J295  | 56.42  | 0.434433462 | DMA4_pat ; |
| J407  | 68     | 0           | ;          |
| J296  | 30.91  | 1.787041154 | DMA4_pat ; |
| J408  | 7.93   | 1.332556154 | DMA1_pat ; |

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|      |        |             |            |
|------|--------|-------------|------------|
| J297 | 79.05  | 1.402524231 | DMA4_pat ; |
| J298 | 74.46  | 0.541834615 | DMA4_pat ; |
| J191 | 5.76   | 1.170013846 | DMA1_pat ; |
| J303 | 50.42  | 1.865885769 | DMA4_pat ; |
| J192 | 12.4   | 1.880776154 | DMA1_pat ; |
| J193 | 12.99  | 0.997330385 | DMA1_pat ; |
| J305 | 47.11  | 2.257748077 | DMA4_pat ; |
| J194 | 13.46  | 1.865018077 | DMA1_pat ; |
| J195 | 15.39  | 0.221398846 | DMA1_pat ; |
| J196 | 13.35  | 1.586428846 | DMA1_pat ; |
| J308 | 33.24  | 1.78257     | DMA1_pat ; |
| J198 | 18.54  | 0.039205385 | DMA1_pat ; |
| J200 | 15.75  | 1.077860769 | DMA1_pat ; |
| J199 | 16.26  | 1.004957308 | DMA1_pat ; |
| J201 | 35.86  | 0.688239231 | DMA1_pat ; |
| J202 | 10.41  | 2.463435    | DMA1_pat ; |
| J203 | 11.03  | 2.006469231 | DMA1_pat ; |
| J204 | 21.51  | 1.740252692 | DMA1_pat ; |
| J205 | 16.66  | 1.043997692 | DMA1_pat ; |
| J206 | 14.12  | 1.836220385 | DMA1_pat ; |
| J207 | 18.86  | 0.692920385 | DMA1_pat ; |
| J208 | 11.25  | 0.891466154 | DMA1_pat ; |
| J101 | 28.65  | 1.083642692 | DMA1_pat ; |
| J102 | 36.96  | 2.362428462 | DMA1_pat ; |
| J109 | 17.47  | 0.303874615 | DMA1_pat ; |
| J1   | 16.82  | 1.614879231 | DMA1_pat ; |
| J2   | 11.97  | 0.869582308 | DMA1_pat ; |
| J3   | 29.02  | 0.261080769 | DMA1_pat ; |
| J4   | 20.88  | 0.463505769 | DMA1_pat ; |
| J5   | 22.75  | 0.194211923 | DMA1_pat ; |
| J6   | 15.25  | 1.081899231 | DMA1_pat ; |
| J7   | 24.91  | 2.398178077 | DMA1_pat ; |
| J8   | 31.17  | 1.355073462 | DMA1_pat ; |
| J9   | 31.89  | 1.235941154 | DMA1_pat ; |
| J10  | 14.62  | 2.432416154 | DMA1_pat ; |
| J11  | 18.43  | 0.5445      | DMA1_pat ; |
| J12  | 29.27  | 0.947478462 | DMA1_pat ; |
| J13  | 32.04  | 0.989611154 | DMA1_pat ; |
| J14  | 37.91  | 0           | ;          |
| J15  | 102.84 | 0           | ;          |
| J16  | 88.89  | 0.346153846 | DMA2_pat ; |
| J17  | 82.75  | 0           | ;          |

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|      |       |             |          |   |
|------|-------|-------------|----------|---|
| J18  | 84.96 | 0           |          | ; |
| J19  | 90.94 | 0.346153846 | DMA2_pat | ; |
| J20  | 80    | 0           |          | ; |
| J21  | 80    | 0.346153846 | DMA2_pat | ; |
| J22  | 82.74 | 0           |          | ; |
| J23  | 75.96 | 0           |          | ; |
| J25  | 94.13 | 0.161226923 | DMA2_pat | ; |
| J26  | 76.35 | 1.890230769 | DMA2_pat | ; |
| J27  | 82.08 | 1.751285769 | DMA2_pat | ; |
| J28  | 45    | 1.242678462 | DMA2_pat | ; |
| J29  | 49    | 0.38859     | DMA2_pat | ; |
| J30  | 72.01 | 0.559344231 | DMA2_pat | ; |
| J31  | 69.78 | 0.815359615 | DMA2_pat | ; |
| J32  | 45    | 1.961221154 | DMA2_pat | ; |
| J33  | 48    | 0.125656154 | DMA2_pat | ; |
| J34  | 50    | 1.29504     | DMA2_pat | ; |
| J35  | 67.78 | 1.892574231 | DMA2_pat | ; |
| J36  | 51.08 | 2.001675    | DMA2_pat | ; |
| J37  | 66.19 | 0.813013846 | DMA2_pat | ; |
| J38  | 47    | 2.431821923 | DMA2_pat | ; |
| J24  | 34.53 | 2.010668077 | DMA1_pat | ; |
| J39  | 45.88 | 1.687065    | DMA1_pat | ; |
| J40  | 12.8  | 2.262823846 | DMA1_pat | ; |
| J123 | 38.41 | 2.189449615 | DMA3_pat | ; |
| J140 | 39.94 | 1.041620769 | DMA3_pat | ; |
| J141 | 41.45 | 0.307706538 | DMA3_pat | ; |
| J157 | 31.49 | 2.385394615 | DMA3_pat | ; |
| J158 | 25.88 | 1.993243846 | DMA3_pat | ; |
| J168 | 40.21 | 1.740713077 | DMA3_pat | ; |
| J170 | 46.87 | 1.004011154 | DMA3_pat | ; |
| J176 | 50.64 | 0.040744615 | DMA3_pat | ; |
| J178 | 58.87 | 0.419406923 | DMA3_pat | ; |
| J184 | 56.09 | 0.410585769 | DMA3_pat | ; |
| J185 | 43.71 | 1.274299615 | DMA3_pat | ; |
| J190 | 58.49 | 1.015156154 | DMA3_pat | ; |
| J197 | 41.86 | 0.265335    | DMA3_pat | ; |
| J213 | 52.07 | 0.690309231 | DMA3_pat | ; |
| J215 | 75.76 | 1.607618077 | DMA3_pat | ; |
| J216 | 53.06 | 2.122750385 | DMA3_pat | ; |
| J227 | 52.89 | 1.244923846 | DMA3_pat | ; |
| J238 | 44.16 | 0.469438846 | DMA3_pat | ; |
| J239 | 43.49 | 2.241541154 | DMA3_pat | ; |

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|      |        |             |            |
|------|--------|-------------|------------|
| J255 | 35.31  | 0.932035385 | DMA3_pat ; |
| J256 | 40     | 0           | ;          |
| J258 | 51.24  | 1.927081154 | DMA3_pat ; |
| J260 | 32.53  | 0.545000769 | DMA3_pat ; |
| J265 | 50.87  | 1.117483846 | DMA3_pat ; |
| J266 | 39.83  | 0.59007     | DMA3_pat ; |
| J267 | 22.31  | 2.195960769 | DMA4_pat ; |
| J61  | 72     | 1.526081538 | DMA5_pat ; |
| J92  | 72     | 0.936080769 | DMA5_pat ; |
| J268 | 69.68  | 0.973755    | DMA4_pat ; |
| J278 | 104.29 | 2.151474231 | DMA2_pat ; |
| J281 | 83.72  | 1.464844615 | DMA2_pat ; |
| J283 | 94.06  | 2.328898846 | DMA2_pat ; |
| J284 | 77.38  | 1.292981538 | DMA2_pat ; |
| J136 | 81.8   | 0.825751154 | DMA2_pat ; |
| J137 | 9.11   | 2.171134615 | DMA1_pat ; |
| J145 | 47.46  | 0.647651538 | DMA3_pat ; |
| J118 | 75     | 0.648853846 | DMA5_pat ; |
| J52  | 54.7   | 0.446733462 | DMA4_pat ; |
| J81  | 50     | 0.867393462 | DMA2_pat ; |
| J88  | 45     | 0.006264231 | DMA2_pat ; |
| J90  | 84     | 1.855855385 | DMA2_pat ; |
| J93  | 65     | 6.306651923 | DMA2_pat ; |
| J147 | 68     | 0.696474231 | DMA2_pat ; |
| J148 | 50     | 1.757425385 | DMA2_pat ; |
| J149 | 40     | 1.012163077 | DMA2_pat ; |
| J150 | 60     | 2.028928846 | DMA2_pat ; |
| J151 | 60     | 1.854451154 | DMA2_pat ; |
| J152 | 32     | 1.09416     | DMA2_pat ; |
| J153 | 60     | 0.194951538 | DMA2_pat ; |
| J169 | 42     | 1.026579231 | DMA2_pat ; |
| J182 | 40     | 0.848438077 | DMA2_pat ; |
| J222 | 32     | 1.776385385 | DMA2_pat ; |
| J224 | 37     | 0.78072     | DMA2_pat ; |
| J230 | 30     | 1.996933846 | DMA4_pat ; |
| J235 | 53     | 0.379390385 | DMA4_pat ; |
| J240 | 87     | 1.482478846 | DMA2_pat ; |
| J269 | 56     | 0           | ;          |
| J273 | 56     | 0           | ;          |
| J274 | 56     | 0           | ;          |
| J276 | 56     | 0           | ;          |
| J280 | 56     | 0           | ;          |

|      |       |             |          |   |
|------|-------|-------------|----------|---|
| J285 | 56    | 0           |          | ; |
| J287 | 40    | 0           |          | ; |
| J288 | 40    | 0           |          | ; |
| J289 | 40    | 0           |          | ; |
| J290 | 40    | 0           |          | ; |
| J291 | 65    | 0           |          | ; |
| J292 | 40    | 0           |          | ; |
| J299 | 40    | 0           |          | ; |
| J300 | 40    | 0           |          | ; |
| J301 | 44    | 0           |          | ; |
| J302 | 44    | 0           |          | ; |
| J304 | 44    | 0           |          | ; |
| J306 | 44    | 0           |          | ; |
| J307 | 44    | 0           |          | ; |
| J309 | 44    | 0           |          | ; |
| J317 | 44    | 0           |          | ; |
| J323 | 44    | 0           |          | ; |
| N1   | 46.5  | 1.730769231 | DMA3_pat | ; |
| N2   | 45.2  | 1.615384615 | DMA3_pat | ; |
| N3   | 45.9  | 1.038461538 | DMA3_pat | ; |
| N4   | 45.5  | 1.384615385 | DMA3_pat | ; |
| N5   | 45.1  | 0.807692308 | DMA3_pat | ; |
| N6   | 46.7  | 1.153846154 | DMA3_pat | ; |
| N7   | 46.3  | 1.384615385 | DMA3_pat | ; |
| N8   | 45.9  | 0.807692308 | DMA3_pat | ; |
| N9   | 45    | 0.980769231 | DMA3_pat | ; |
| N10  | 45.1  | 0.807692308 | DMA3_pat | ; |
| N11  | 47.46 | 0           |          | ; |

## [RESERVOIRS]

| ;ID | Head | Pattern |
|-----|------|---------|
| R1  | 59   | ;       |

## [TANKS]

| ;ID | Elevation | InitLevel | MinLevel | MaxLevel | Diameter | MinVol | VolCurve |
|-----|-----------|-----------|----------|----------|----------|--------|----------|
| T3  | 112.9     | 3.375     | 0        | 6.75     | 13.73    | 0      | ;        |
| T1  | 71.5      | 3.25      | 0        | 6.5      | 31.3     | 0      | ;        |
| T7  | 102       | 2.5       | 0        | 5        | 7.14     | 0      | ;        |
| T6  | 101.5     | 2.75      | 0        | 5.5      | 8.33     | 0      | ;        |
| T5  | 105.8     | 2.25      | 0        | 4.5      | 11.89    | 0      | ;        |
| T2  | 65        | 2.95      | 0        | 5.9      | 20.78    | 0      | ;        |

T4      132.5      2.35      0      4.7      11.64      0      ;

[PIPES]

| ;ID   | Node1 | Node2 | Length | Diameter | Roughness | MinorLoss | Status |
|-------|-------|-------|--------|----------|-----------|-----------|--------|
| P1    | J175  | J174  | 52.9   | 203      | 72.4549   | 0         | Open ; |
| P10   | J335  | J336  | 79.23  | 76       | 108.0095  | 0         | Open ; |
| P100  | J159  | J160  | 107.9  | 406      | 76.5142   | 0         | Open ; |
| P1000 | J341  | J204  | 109.3  | 203      | 76.9461   | 0         | Open ; |
| P101  | J166  | J162  | 243.4  | 254      | 84.2085   | 0         | Open ; |
| P1016 | J22   | J233  | 164.8  | 305      | 85.2382   | 0         | Open ; |
| P102  | J109  | J408  | 1280   | 508      | 92.9472   | 0         | Open ; |
| P1022 | J281  | J283  | 200.8  | 102      | 99.5808   | 0         | Open ; |
| P1023 | J278  | J283  | 136.3  | 102      | 95.6885   | 0         | Open ; |
| P1024 | J580  | J278  | 375.6  | 102      | 89.6207   | 0         | Open ; |
| P1025 | J575  | J132  | 39.18  | 76       | 97.7766   | 0         | Open ; |
| P1026 | J132  | J493  | 45.61  | 76       | 88.4504   | 0         | Open ; |
| P1027 | J486  | J488  | 82.32  | 51       | 92.0106   | 0         | Open ; |
| P1028 | J489  | J486  | 9.57   | 51       | 86.9934   | 0         | Open ; |
| P1029 | J489  | J492  | 122.6  | 76       | 91.3396   | 0         | Open ; |
| P103  | J2    | J1219 | 35.98  | 254      | 79.371    | 0         | Open ; |
| P1030 | J493  | J489  | 95.25  | 76       | 104.6083  | 0         | Open ; |
| P1031 | J494  | J490  | 188.3  | 152      | 84.3741   | 0         | Open ; |
| P1032 | J490  | J492  | 143.3  | 152      | 98.431    | 0         | Open ; |
| P1033 | J492  | J131  | 128.8  | 152      | 84.6894   | 0         | Open ; |
| P1034 | J254  | J253  | 52.87  | 203      | 97.4185   | 0         | Open ; |
| P1035 | J253  | J128  | 122.5  | 152      | 97.7581   | 0         | Open ; |
| P1036 | J131  | J128  | 83.33  | 203      | 74.2979   | 0         | Open ; |
| P1039 | J573  | J128  | 121.4  | 203      | 92.1423   | 0         | Open ; |
| P104  | J166  | J167  | 33.11  | 203      | 99.8866   | 0         | Open ; |
| P1040 | J136  | J573  | 29.45  | 152      | 94.6888   | 0         | Open ; |
| P1041 | J136  | J129  | 307.5  | 102      | 112.5082  | 0         | Open ; |
| P1042 | J89   | J573  | 84.54  | 152      | 76.1502   | 0         | Open ; |
| P1044 | T5    | J64   | 65.8   | 203      | 100.2182  | 0         | Open ; |
| P1045 | J64   | J53   | 68.63  | 203      | 118.8214  | 0         | Open ; |
| P106  | J102  | J101  | 270.4  | 102      | 63.5511   | 0         | Open ; |
| P107  | J171  | J172  | 357    | 203      | 80.5098   | 0         | Open ; |
| P108  | J101  | J109  | 183.5  | 203      | 78.7205   | 0         | Open ; |
| P109  | J175  | J172  | 218.5  | 203      | 76.8934   | 0         | Open ; |
| P11   | J318  | J235  | 83.45  | 101.6    | 96.8344   | 0         | Open ; |
| P110  | J179  | J177  | 425.8  | 508      | 98.9941   | 0         | Open ; |
| P111  | J976  | J143  | 126.4  | 152      | 72.4117   | 0         | Open ; |
| P112  | J142  | J976  | 647    | 305      | 68.6009   | 0         | Open ; |

|      |       |       |       |       |          |   |        |
|------|-------|-------|-------|-------|----------|---|--------|
| P113 | J137  | J181  | 310.7 | 152   | 85.3538  | 0 | Open ; |
| P115 | J408  | J435  | 99.88 | 102   | 91.2315  | 0 | Open ; |
| P116 | J186  | J187  | 204.5 | 152   | 93.4739  | 0 | Open ; |
| P117 | J435  | J431  | 104   | 102   | 67.962   | 0 | Open ; |
| P118 | J431  | J432  | 115.9 | 102   | 84.6653  | 0 | Open ; |
| P119 | J188  | J189  | 64.88 | 305   | 78.1412  | 0 | Open ; |
| P12  | J208  | J337  | 85.24 | 406   | 89.6626  | 0 | Open ; |
| P120 | J432  | J1160 | 91.4  | 102   | 88.389   | 0 | Open ; |
| P121 | J192  | J193  | 42.23 | 152   | 100.3676 | 0 | Open ; |
| P122 | J173  | J194  | 45.06 | 305   | 78.978   | 0 | Open ; |
| P123 | J1160 | J3    | 51.21 | 152   | 61.0614  | 0 | Open ; |
| P124 | J376  | J225  | 99.09 | 102   | 78.8303  | 0 | Open ; |
| P125 | J163  | J196  | 193.4 | 508   | 84.7389  | 0 | Open ; |
| P126 | J225  | J316  | 109.6 | 76    | 89.7379  | 0 | Open ; |
| P127 | J316  | J40   | 87.22 | 102   | 73.6774  | 0 | Open ; |
| P128 | J40   | J374  | 165.6 | 102   | 90.9483  | 0 | Open ; |
| P129 | J374  | J377  | 79.59 | 102   | 78.0662  | 0 | Open ; |
| P13  | J337  | J24   | 62.56 | 406   | 83.0438  | 0 | Open ; |
| P130 | J376  | J226  | 56.79 | 76    | 70.7072  | 0 | Open ; |
| P131 | J206  | J207  | 86.5  | 76    | 74.7267  | 0 | Open ; |
| P132 | J226  | J379  | 67.35 | 76    | 88.5417  | 0 | Open ; |
| P134 | J4    | J5    | 68.79 | 76    | 78.568   | 0 | Open ; |
| P136 | J5    | J431  | 241.8 | 102   | 75.7332  | 0 | Open ; |
| P138 | J203  | J217  | 19.28 | 254   | 72.4853  | 0 | Open ; |
| P139 | J208  | J211  | 73.66 | 406   | 68.7185  | 0 | Open ; |
| P14  | J24   | J39   | 151.4 | 406   | 72.0091  | 0 | Open ; |
| P140 | J219  | J220  | 222.3 | 102   | 107.8347 | 0 | Open ; |
| P141 | J221  | J51   | 169.9 | 102   | 103.7881 | 0 | Open ; |
| P142 | J37   | J93   | 16.61 | 152.4 | 85.3907  | 0 | Open ; |
| P144 | J382  | T6    | 130.8 | 76    | 99.9191  | 0 | Open ; |
| P147 | J232  | J231  | 60.08 | 203   | 92.837   | 0 | Open ; |
| P148 | J233  | J234  | 561.7 | 305   | 96.4394  | 0 | Open ; |
| P15  | J39   | T1    | 395.3 | 406   | 90.483   | 0 | Open ; |
| P150 | J82   | J50   | 93.19 | 152   | 103.1527 | 0 | Open ; |
| P154 | J245  | J66   | 170.6 | 152   | 108.8316 | 0 | Open ; |
| P155 | J60   | J219  | 59.38 | 101.6 | 105.7092 | 0 | Open ; |
| P156 | J242  | J243  | 80.34 | 102   | 110.8685 | 0 | Open ; |
| P157 | J244  | J245  | 232.9 | 102   | 102.901  | 0 | Open ; |
| P158 | J236  | J246  | 69.88 | 76    | 105.0724 | 0 | Open ; |
| P159 | J204  | J336  | 118.8 | 203   | 80.1472  | 0 | Open ; |
| P16  | J1208 | J353  | 252.3 | 102   | 97.2483  | 0 | Open ; |
| P160 | J248  | J246  | 68.68 | 76    | 104.6279 | 0 | Open ; |

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|      |       |       |       |       |          |   |      |   |
|------|-------|-------|-------|-------|----------|---|------|---|
| P161 | J361  | J355  | 40.31 | 76    | 90.0133  | 0 | Open | ; |
| P162 | J249  | J85   | 190.7 | 152   | 98.7606  | 0 | Open | ; |
| P163 | J251  | J90   | 67.74 | 203   | 94.2302  | 0 | Open | ; |
| P165 | J135  | J234  | 143.8 | 305   | 92.9343  | 0 | Open | ; |
| P166 | J352  | J382  | 235   | 101.6 | 93.6027  | 0 | Open | ; |
| P17  | J408  | J1025 | 32.42 | 508   | 77.2813  | 0 | Open | ; |
| P174 | J6    | J7    | 278.6 | 102   | 89.3207  | 0 | Open | ; |
| P177 | J305  | J303  | 56.8  | 102   | 100.6056 | 0 | Open | ; |
| P18  | J1025 | J411  | 283.3 | 508   | 100.3    | 0 | Open | ; |
| P184 | J1208 | J352  | 59.38 | 101.6 | 95.9147  | 0 | Open | ; |
| P19  | J411  | J1056 | 750.9 | 508   | 97.7     | 0 | Open | ; |
| P195 | J7    | J4    | 144.3 | 76    | 80.6314  | 0 | Open | ; |
| P2   | J175  | J181  | 295.3 | 203   | 62.0478  | 0 | Open | ; |
| P20  | J1056 | J214  | 579.7 | 508   | 89.6725  | 0 | Open | ; |
| P201 | J7    | J8    | 102.2 | 76    | 96.6278  | 0 | Open | ; |
| P21  | J214  | J212  | 176.5 | 406   | 86.6937  | 0 | Open | ; |
| P211 | J295  | J296  | 202.3 | 76    | 84.0517  | 0 | Open | ; |
| P215 | J419  | T2    | 140.8 | 254   | 81.4235  | 0 | Open | ; |
| P218 | J310  | J311  | 54.55 | 102   | 81.7714  | 0 | Open | ; |
| P219 | J312  | J313  | 67.98 | 102   | 86.836   | 0 | Open | ; |
| P22  | J159  | J192  | 567.3 | 406   | 81.1136  | 0 | Open | ; |
| P220 | J314  | J315  | 68.33 | 76    | 93.7376  | 0 | Open | ; |
| P223 | J318  | J319  | 109   | 203   | 93.217   | 0 | Open | ; |
| P225 | J321  | J322  | 120.8 | 102   | 92.6855  | 0 | Open | ; |
| P228 | J327  | J328  | 42.72 | 76    | 99.2889  | 0 | Open | ; |
| P23  | J192  | J196  | 316.9 | 508   | 77.1626  | 0 | Open | ; |
| P230 | J330  | J327  | 114.6 | 76    | 77.3953  | 0 | Open | ; |
| P231 | J331  | J330  | 12.21 | 76    | 98.4154  | 0 | Open | ; |
| P233 | J333  | J334  | 58.66 | 76    | 97.2959  | 0 | Open | ; |
| P234 | J335  | J333  | 41.63 | 76    | 87.2098  | 0 | Open | ; |
| P235 | J336  | J337  | 92.74 | 76    | 84.3219  | 0 | Open | ; |
| P237 | J415  | J441  | 12.01 | 305   | 100      | 0 | Open | ; |
| P238 | J441  | J416  | 12.59 | 304.8 | 104.74   | 0 | Open | ; |
| P24  | J177  | J194  | 71.05 | 508   | 88.6208  | 0 | Open | ; |
| P241 | J344  | J345  | 49.46 | 102   | 114.8367 | 0 | Open | ; |
| P242 | J36   | J29   | 25.06 | 152.4 | 99.015   | 0 | Open | ; |
| P243 | J36   | J88   | 57.08 | 203.2 | 82.7962  | 0 | Open | ; |
| P245 | J87   | J84   | 18.65 | 152.4 | 120.3989 | 0 | Open | ; |
| P246 | J249  | J250  | 56.94 | 152.4 | 121.5968 | 0 | Open | ; |
| P248 | J250  | J245  | 6.96  | 152.4 | 110.0673 | 0 | Open | ; |
| P249 | J359  | J360  | 28.43 | 51    | 85.3808  | 0 | Open | ; |
| P25  | J196  | J194  | 4.3   | 508   | 74.3773  | 0 | Open | ; |

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|      |      |      |       |       |          |   |      |   |
|------|------|------|-------|-------|----------|---|------|---|
| P251 | J329 | J362 | 11.49 | 152   | 103.7333 | 0 | Open | ; |
| P252 | J363 | J364 | 135.4 | 305   | 82.3004  | 0 | Open | ; |
| P255 | J369 | J370 | 76.14 | 51    | 71.4672  | 0 | Open | ; |
| P256 | J371 | J364 | 55.17 | 305   | 94.8591  | 0 | Open | ; |
| P258 | J372 | J373 | 79.53 | 102   | 75.5123  | 0 | Open | ; |
| P259 | J374 | J375 | 136.1 | 102   | 83.0936  | 0 | Open | ; |
| P26  | J163 | J1   | 22.94 | 508   | 88.0075  | 0 | Open | ; |
| P264 | J242 | J241 | 11.73 | 101.6 | 112.5051 | 0 | Open | ; |
| P266 | J250 | J242 | 55.29 | 101.6 | 107.0558 | 0 | Open | ; |
| P267 | J572 | J147 | 344.6 | 152.4 | 95.5913  | 0 | Open | ; |
| P268 | J130 | J149 | 146.5 | 152.4 | 86.8378  | 0 | Open | ; |
| P27  | J1   | J161 | 163.6 | 254   | 69.1055  | 0 | Open | ; |
| P270 | J149 | J150 | 88.36 | 101.6 | 92.7697  | 0 | Open | ; |
| P272 | J8   | J9   | 143.9 | 102   | 73.9529  | 0 | Open | ; |
| P275 | J149 | J148 | 173   | 152.4 | 98.1649  | 0 | Open | ; |
| P28  | J1   | J164 | 117.4 | 152   | 88.2667  | 0 | Open | ; |
| P280 | J407 | J401 | 333.4 | 203   | 88.343   | 0 | Open | ; |
| P282 | J436 | J10  | 131.9 | 102   | 86.7204  | 0 | Open | ; |
| P284 | J574 | J151 | 199   | 76.2  | 89.125   | 0 | Open | ; |
| P285 | J151 | J153 | 130.7 | 76.2  | 90.1826  | 0 | Open | ; |
| P286 | J169 | J182 | 155.6 | 101.6 | 90.0054  | 0 | Open | ; |
| P287 | J419 | J420 | 45.12 | 254   | 78.3493  | 0 | Open | ; |
| P288 | J169 | J222 | 226.7 | 76.2  | 85.0527  | 0 | Open | ; |
| P29  | J1   | J165 | 20.51 | 152   | 89.4838  | 0 | Open | ; |
| P290 | J222 | J224 | 46.28 | 76.2  | 89.4448  | 0 | Open | ; |
| P291 | J425 | J426 | 132.9 | 305   | 107.08   | 0 | Open | ; |
| P292 | J416 | J427 | 13.54 | 305   | 97.2663  | 0 | Open | ; |
| P293 | J427 | J425 | 125.2 | 305   | 92.1591  | 0 | Open | ; |
| P294 | J428 | J429 | 101.2 | 102   | 79.9651  | 0 | Open | ; |
| P295 | J10  | J435 | 133.2 | 76    | 72.4092  | 0 | Open | ; |
| P296 | J432 | J433 | 231.9 | 76    | 82.9572  | 0 | Open | ; |
| P297 | J411 | J438 | 42.53 | 406   | 73       | 0 | Open | ; |
| P298 | J438 | J434 | 40.11 | 305   | 84.5511  | 0 | Open | ; |
| P299 | J436 | J429 | 61.51 | 102   | 87.7099  | 0 | Open | ; |
| P3   | J181 | J173 | 136.5 | 300   | 73.6491  | 0 | Open | ; |
| P30  | J161 | J166 | 40.89 | 254   | 86.7096  | 0 | Open | ; |
| P301 | J434 | J11  | 45.31 | 305   | 85.1892  | 0 | Open | ; |
| P302 | J11  | J433 | 178.3 | 305   | 80.3402  | 0 | Open | ; |
| P303 | J428 | J439 | 131.9 | 76    | 88.3345  | 0 | Open | ; |
| P304 | J222 | J152 | 268.7 | 101.6 | 89.3927  | 0 | Open | ; |
| P305 | J407 | J441 | 43.41 | 203   | 90.7993  | 0 | Open | ; |
| P307 | J433 | J12  | 47.3  | 305   | 60.5122  | 0 | Open | ; |

|      |       |      |       |       |          |   |      |   |
|------|-------|------|-------|-------|----------|---|------|---|
| P308 | J426  | J363 | 334.6 | 305   | 88.0772  | 0 | Open | ; |
| P309 | J235  | J230 | 128.8 | 101.6 | 94.956   | 0 | Open | ; |
| P31  | J171  | J186 | 144.7 | 152   | 108.7731 | 0 | Open | ; |
| P310 | J269  | J156 | 9     | 610   | 87.268   | 0 | Open | ; |
| P316 | R1    | J280 | 11.62 | 610   | 70.4519  | 0 | Open | ; |
| P319 | J274  | J269 | 10.54 | 610   | 76.5927  | 0 | Open | ; |
| P32  | J186  | J2   | 84.44 | 152   | 103.5584 | 0 | Open | ; |
| P320 | J273  | J269 | 11.47 | 610   | 76.5188  | 0 | Open | ; |
| P322 | J280  | J285 | 11.5  | 610   | 89.4331  | 0 | Open | ; |
| P323 | J280  | J276 | 11.47 | 610   | 84.6872  | 0 | Open | ; |
| P329 | J503  | J501 | 134.5 | 152   | 100.1836 | 0 | Open | ; |
| P33  | J1219 | J179 | 22.81 | 254   | 73.036   | 0 | Open | ; |
| P330 | J501  | J499 | 66.79 | 76    | 96.4229  | 0 | Open | ; |
| P331 | J486  | J487 | 93.46 | 51    | 93.1933  | 0 | Open | ; |
| P336 | J495  | J496 | 183   | 152   | 92.1737  | 0 | Open | ; |
| P337 | J497  | J494 | 20.49 | 305   | 100      | 0 | Open | ; |
| P338 | J499  | J500 | 74.38 | 76    | 100.3553 | 0 | Open | ; |
| P339 | J501  | J502 | 307.5 | 102   | 88.653   | 0 | Open | ; |
| P34  | J179  | J110 | 98    | 508   | 78.506   | 0 | Open | ; |
| P340 | J494  | J496 | 96.21 | 305   | 101.0824 | 0 | Open | ; |
| P341 | J496  | J498 | 189.7 | 305   | 94.6355  | 0 | Open | ; |
| P343 | J495  | J576 | 111.7 | 152   | 100.2909 | 0 | Open | ; |
| P344 | J576  | J571 | 45.26 | 152   | 85.9092  | 0 | Open | ; |
| P346 | J499  | J504 | 54.91 | 51    | 93.9134  | 0 | Open | ; |
| P347 | J509  | T4   | 385.6 | 305   | 96.2352  | 0 | Open | ; |
| P348 | J503  | J509 | 42.47 | 305   | 88.7295  | 0 | Open | ; |
| P349 | J503  | J511 | 39.12 | 305   | 97.0124  | 0 | Open | ; |
| P35  | J50   | J51  | 64.56 | 152   | 84.3826  | 0 | Open | ; |
| P350 | J509  | J240 | 400.2 | 203   | 99.8598  | 0 | Open | ; |
| P37  | J348  | J52  | 180.6 | 203   | 97.8039  | 0 | Open | ; |
| P372 | J219  | J86  | 6.42  | 101.6 | 113.1147 | 0 | Open | ; |
| P374 | J287  | J288 | 15.83 | 254   | 91.9156  | 0 | Open | ; |
| P375 | J288  | J300 | 7.79  | 254   | 75.4894  | 0 | Open | ; |
| P376 | J300  | J299 | 6.64  | 254   | 102.6856 | 0 | Open | ; |
| P378 | J292  | J256 | 6.47  | 254   | 112.4497 | 0 | Open | ; |
| P379 | J287  | J289 | 6.43  | 254   | 101.7753 | 0 | Open | ; |
| P38  | J55   | J56  | 169.5 | 76    | 106.465  | 0 | Open | ; |
| P380 | J289  | J290 | 4.79  | 254   | 87.8132  | 0 | Open | ; |
| P381 | J291  | J415 | 5.53  | 304.8 | 119.2071 | 0 | Open | ; |
| P383 | J571  | J491 | 19.56 | 152   | 80.1493  | 0 | Open | ; |
| P384 | J491  | J575 | 26.14 | 76    | 101.9127 | 0 | Open | ; |
| P385 | J498  | J134 | 106.5 | 305   | 76.0237  | 0 | Open | ; |

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|------|-------|-------|-------|-------|----------|---|------|---|
| P386 | J134  | J576  | 8.12  | 152   | 79.9011  | 0 | Open | ; |
| P39  | J490  | J488  | 190.1 | 102   | 95.4376  | 0 | Open | ; |
| P397 | J332  | J301  | 13.16 | 203.2 | 87.4272  | 0 | Open | ; |
| P398 | J301  | J302  | 6.75  | 203.2 | 91.0504  | 0 | Open | ; |
| P399 | J302  | J307  | 9.71  | 203.2 | 81.4136  | 0 | Open | ; |
| P40  | J59   | J60   | 143.6 | 102   | 107.9144 | 0 | Open | ; |
| P402 | J307  | J309  | 6.12  | 203.2 | 89.1549  | 0 | Open | ; |
| P403 | J304  | J306  | 6.86  | 152.4 | 111.4725 | 0 | Open | ; |
| P409 | J306  | J87   | 26.38 | 152.4 | 89.8979  | 0 | Open | ; |
| P410 | J323  | J317  | 7.7   | 203.2 | 85.6677  | 0 | Open | ; |
| P42  | J54   | J73   | 32.93 | 152   | 114.9191 | 0 | Open | ; |
| P424 | J317  | J384  | 27.8  | 203.2 | 124.9857 | 0 | Open | ; |
| P43  | J64   | J65   | 36.18 | 203   | 88.5373  | 0 | Open | ; |
| P44  | J66   | J67   | 247.7 | 152   | 115.1682 | 0 | Open | ; |
| P443 | J13   | J12   | 67.31 | 305   | 85.576   | 0 | Open | ; |
| P445 | J417  | J421  | 7.8   | 254   | 86.2106  | 0 | Open | ; |
| P446 | J418  | J421  | 31.15 | 254   | 102.1976 | 0 | CV   | ; |
| P450 | J418  | J422  | 19.47 | 254   | 96.9651  | 0 | Open | ; |
| P46  | J69   | J70   | 70.86 | 102   | 112.6626 | 0 | Open | ; |
| P465 | J421  | J14   | 18.2  | 254   | 86.5654  | 0 | Open | ; |
| P467 | J422  | J420  | 15.17 | 254   | 96.1541  | 0 | Open | ; |
| P468 | J420  | J287  | 31.29 | 254   | 105.2734 | 0 | Open | ; |
| P48  | J73   | J71   | 28.98 | 152   | 113.5196 | 0 | Open | ; |
| P482 | J9    | J3    | 321.9 | 152   | 78.9039  | 0 | Open | ; |
| P484 | J438  | J13   | 336.6 | 203   | 79.98    | 0 | Open | ; |
| P49  | J72   | J74   | 134.9 | 152   | 121.705  | 0 | Open | ; |
| P492 | J86   | J243  | 157.3 | 101.6 | 114.1137 | 0 | Open | ; |
| P5   | J1223 | J218  | 589   | 406   | 83.5619  | 0 | Open | ; |
| P500 | J90   | J252  | 24.23 | 203   | 112.6228 | 0 | Open | ; |
| P501 | J571  | J572  | 11.32 | 152.4 | 111.4535 | 0 | Open | ; |
| P502 | J89   | J574  | 9.19  | 76.2  | 99.5946  | 0 | Open | ; |
| P51  | J68   | J77   | 57.47 | 102   | 92.2379  | 0 | Open | ; |
| P510 | J16   | J15   | 193.4 | 102   | 104.9547 | 0 | Open | ; |
| P52  | J78   | J51   | 83.26 | 102   | 89.6542  | 0 | Open | ; |
| P524 | J511  | J580  | 170.5 | 305   | 96.2278  | 0 | Open | ; |
| P527 | J580  | J497  | 149   | 305   | 73.1242  | 0 | Open | ; |
| P529 | J278  | J281  | 212.3 | 102   | 103.9178 | 0 | Open | ; |
| P53  | J384  | J1208 | 10.32 | 203   | 87.5607  | 0 | Open | ; |
| P54  | J488  | J491  | 111.7 | 51    | 92.3979  | 0 | Open | ; |
| P55  | J82   | J83   | 99.86 | 76    | 87.653   | 0 | Open | ; |
| P57  | J84   | J85   | 288.8 | 152   | 99.5967  | 0 | Open | ; |
| P58  | J86   | J84   | 503.9 | 102   | 100.8492 | 0 | Open | ; |

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|------|-------|-------|-------|-----|----------|---|------|---|
| P596 | J56   | J58   | 76.39 | 76  | 112.8056 | 0 | Open | ; |
| P597 | J281  | J284  | 79.68 | 102 | 101.1212 | 0 | Open | ; |
| P6   | J180  | J171  | 199.4 | 152 | 94.6451  | 0 | Open | ; |
| P609 | J57   | J56   | 86.07 | 76  | 111.6336 | 0 | Open | ; |
| P610 | J15   | J17   | 206.6 | 76  | 95.7998  | 0 | Open | ; |
| P63  | J96   | J95   | 166   | 254 | 88.7273  | 0 | Open | ; |
| P633 | J54   | J67   | 173.9 | 152 | 119.1333 | 0 | Open | ; |
| P64  | J96   | J97   | 126.6 | 203 | 80.2477  | 0 | Open | ; |
| P65  | J353  | J351  | 164.9 | 102 | 101.9473 | 0 | Open | ; |
| P67  | J97   | J102  | 330.2 | 203 | 74.1138  | 0 | Open | ; |
| P670 | J17   | J18   | 54.41 | 152 | 98.7041  | 0 | Open | ; |
| P671 | J18   | J16   | 62.97 | 152 | 94.8379  | 0 | Open | ; |
| P68  | J195  | J188  | 302.7 | 305 | 83.2209  | 0 | Open | ; |
| P69  | J1223 | J40   | 103.6 | 152 | 72.3518  | 0 | Open | ; |
| P697 | J16   | J19   | 88.89 | 102 | 97.7625  | 0 | Open | ; |
| P7   | J218  | J211  | 60.22 | 508 | 78.4537  | 0 | Open | ; |
| P70  | J40   | J375  | 88.36 | 152 | 72.8439  | 0 | Open | ; |
| P71  | J188  | J191  | 419.4 | 254 | 84.7287  | 0 | Open | ; |
| P72  | J95   | J110  | 247.5 | 305 | 85.0357  | 0 | Open | ; |
| P724 | J78   | J268  | 92.72 | 152 | 96.707   | 0 | Open | ; |
| P725 | J78   | J295  | 117.3 | 152 | 105.2924 | 0 | Open | ; |
| P752 | J297  | T7    | 70.36 | 152 | 106.1657 | 0 | Open | ; |
| P753 | J297  | J221  | 71.91 | 152 | 89.5241  | 0 | Open | ; |
| P754 | J19   | J15   | 92.49 | 51  | 84.8277  | 0 | Open | ; |
| P755 | J140  | J141  | 47.12 | 305 | 114.1299 | 0 | Open | ; |
| P756 | J123  | J141  | 41.66 | 305 | 107.9167 | 0 | Open | ; |
| P757 | J1024 | J142  | 568.4 | 305 | 99.8313  | 0 | Open | ; |
| P758 | J1025 | J1024 | 102.2 | 305 | 93.3573  | 0 | Open | ; |
| P759 | J221  | J298  | 97.19 | 152 | 104.435  | 0 | Open | ; |
| P760 | J298  | J312  | 88.54 | 152 | 101.8544 | 0 | Open | ; |
| P761 | J312  | J83   | 171.3 | 152 | 96.9921  | 0 | Open | ; |
| P763 | J141  | J157  | 387.6 | 305 | 112.2055 | 0 | Open | ; |
| P766 | J318  | J303  | 37.85 | 152 | 95.0373  | 0 | Open | ; |
| P767 | J157  | J94   | 227.5 | 305 | 109.3149 | 0 | Open | ; |
| P768 | J157  | J158  | 217   | 254 | 116.5116 | 0 | Open | ; |
| P769 | J94   | J168  | 154.3 | 305 | 110.6186 | 0 | Open | ; |
| P771 | J168  | J170  | 69.36 | 203 | 99.6322  | 0 | Open | ; |
| P772 | J168  | J176  | 215   | 305 | 85.8031  | 0 | Open | ; |
| P775 | J176  | J178  | 129.4 | 203 | 108.382  | 0 | Open | ; |
| P776 | J178  | J184  | 144.5 | 102 | 114.3497 | 0 | Open | ; |
| P777 | J176  | J185  | 402.3 | 305 | 111.7656 | 0 | Open | ; |
| P779 | J185  | J190  | 524.5 | 203 | 87.9098  | 0 | Open | ; |

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|------|-------|-------|-------|-----|----------|---|--------|
| P780 | J18   | J406  | 153.6 | 203 | 104.9547 | 0 | Open ; |
| P781 | J83   | J318  | 130.2 | 152 | 90.9141  | 0 | Open ; |
| P783 | J190  | J197  | 675   | 203 | 115.0802 | 0 | Open ; |
| P784 | J213  | J190  | 88.96 | 102 | 98.432   | 0 | Open ; |
| P785 | J190  | J215  | 184.7 | 102 | 89.6475  | 0 | Open ; |
| P786 | J197  | J216  | 166.3 | 203 | 110.0002 | 0 | Open ; |
| P787 | J216  | T3    | 127.1 | 102 | 130.1224 | 0 | Open ; |
| P788 | J216  | J227  | 107.9 | 152 | 113.9141 | 0 | Open ; |
| P789 | J1056 | J366  | 286   | 203 | 74.9687  | 0 | Open ; |
| P791 | J227  | J238  | 82.5  | 152 | 115.9461 | 0 | Open ; |
| P794 | J238  | J239  | 39.04 | 203 | 123.9466 | 0 | Open ; |
| P795 | J239  | J255  | 129.4 | 203 | 97.7803  | 0 | Open ; |
| P796 | J256  | J238  | 22.42 | 203 | 89.8762  | 0 | Open ; |
| P797 | J227  | J258  | 21.64 | 102 | 117.0542 | 0 | Open ; |
| P798 | J255  | J260  | 684.1 | 203 | 116.0879 | 0 | Open ; |
| P8   | J218  | J212  | 11.35 | 406 | 76.0774  | 0 | Open ; |
| P800 | J344  | J1170 | 15.93 | 203 | 109.6676 | 0 | Open ; |
| P801 | J1170 | J347  | 9.47  | 203 | 104.4689 | 0 | Open ; |
| P804 | J1169 | J265  | 68.27 | 102 | 103.0053 | 0 | Open ; |
| P805 | J265  | J266  | 96.57 | 152 | 114.5602 | 0 | Open ; |
| P806 | J266  | J260  | 32.51 | 152 | 103.899  | 0 | Open ; |
| P807 | J260  | J350  | 162.8 | 203 | 100.1493 | 0 | Open ; |
| P808 | J83   | J311  | 253.5 | 203 | 92.0642  | 0 | Open ; |
| P809 | J321  | J324  | 17.35 | 102 | 109.3503 | 0 | Open ; |
| P810 | J406  | J394  | 64.3  | 203 | 88.939   | 0 | Open ; |
| P811 | J320  | J321  | 50.17 | 102 | 89.5672  | 0 | Open ; |
| P813 | J328  | J320  | 30.85 | 152 | 76.0416  | 0 | Open ; |
| P815 | J329  | J328  | 50.52 | 102 | 84.3422  | 0 | Open ; |
| P817 | J1158 | J1153 | 253.3 | 203 | 72.6581  | 0 | Open ; |
| P819 | J1153 | J1157 | 8.02  | 203 | 105.0733 | 0 | Open ; |
| P821 | J354  | J267  | 64.78 | 102 | 83.9452  | 0 | Open ; |
| P822 | J267  | J353  | 11.71 | 102 | 99.5936  | 0 | Open ; |
| P823 | J236  | J237  | 18.84 | 76  | 113.3618 | 0 | Open ; |
| P826 | J237  | J244  | 335.3 | 76  | 99.1486  | 0 | Open ; |
| P827 | J244  | J247  | 119.1 | 76  | 103.7402 | 0 | Open ; |
| P83  | J155  | J160  | 15.14 | 610 | 75.6638  | 0 | Open ; |
| P830 | J247  | J248  | 89.3  | 76  | 99.044   | 0 | Open ; |
| P831 | J248  | J249  | 62.2  | 76  | 86.2918  | 0 | Open ; |
| P84  | J183  | J187  | 148.6 | 203 | 97.4135  | 0 | Open ; |
| P840 | J311  | J320  | 235.3 | 203 | 97.7704  | 0 | Open ; |
| P841 | J297  | J331  | 347.8 | 76  | 93.6766  | 0 | Open ; |
| P842 | J62   | J55   | 64.41 | 52  | 95.5212  | 0 | Open ; |

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|      |       |       |       |       |          |   |      |   |
|------|-------|-------|-------|-------|----------|---|------|---|
| P844 | J59   | J62   | 12.49 | 102   | 113.8083 | 0 | Open | ; |
| P846 | J58   | J118  | 94.84 | 203   | 103.9805 | 0 | Open | ; |
| P847 | J55   | J118  | 68.63 | 152   | 91.0711  | 0 | Open | ; |
| P85  | J132  | J133  | 36.6  | 76    | 69.9267  | 0 | Open | ; |
| P850 | J59   | J57   | 241.1 | 101.6 | 112.5311 | 0 | Open | ; |
| P851 | J62   | J57   | 228.8 | 76    | 121.9332 | 0 | Open | ; |
| P852 | J58   | J67   | 40.39 | 203   | 105.3809 | 0 | Open | ; |
| P853 | J67   | J53   | 295.7 | 203   | 118.6474 | 0 | Open | ; |
| P855 | J92   | J76   | 37.88 | 102   | 114.8547 | 0 | Open | ; |
| P858 | J92   | J68   | 195.4 | 102   | 113.41   | 0 | Open | ; |
| P859 | J71   | J77   | 90.81 | 152   | 95.2859  | 0 | Open | ; |
| P86  | J134  | J135  | 161   | 305   | 110.5    | 0 | Open | ; |
| P861 | J77   | J72   | 110.8 | 152   | 87.941   | 0 | Open | ; |
| P866 | J68   | J61   | 17.37 | 102   | 92.1738  | 0 | Open | ; |
| P87  | J187  | J137  | 80.03 | 203   | 76.3985  | 0 | Open | ; |
| P871 | J61   | J69   | 48.15 | 102   | 91.8071  | 0 | Open | ; |
| P880 | J1160 | J1161 | 112.8 | 76    | 86.035   | 0 | Open | ; |
| P889 | J1169 | J1170 | 15.72 | 203   | 88.7411  | 0 | Open | ; |
| P89  | J375  | J372  | 104.3 | 152   | 78.4305  | 0 | Open | ; |
| P892 | J414  | J13   | 30.39 | 254   | 69.8485  | 0 | Open | ; |
| P9   | J212  | J217  | 49.95 | 254   | 66.7492  | 0 | Open | ; |
| P90  | J372  | J376  | 98.94 | 102   | 62.3189  | 0 | Open | ; |
| P91  | J143  | J144  | 572.3 | 102   | 94.3389  | 0 | Open | ; |
| P914 | J399  | J20   | 38.61 | 203   | 91.18    | 0 | Open | ; |
| P915 | J1208 | J362  | 10.58 | 152   | 72.7725  | 0 | Open | ; |
| P92  | J137  | J180  | 63.12 | 203   | 83.1066  | 0 | Open | ; |
| P924 | J195  | J1219 | 82.38 | 254   | 74.459   | 0 | Open | ; |
| P927 | J210  | J1223 | 348.9 | 406   | 84.5315  | 0 | Open | ; |
| P929 | J401  | J399  | 83.31 | 203   | 90.0826  | 0 | Open | ; |
| P930 | J399  | J21   | 78.95 | 203   | 88.2     | 0 | Open | ; |
| P931 | J20   | J406  | 248.4 | 203   | 87.0831  | 0 | Open | ; |
| P932 | J17   | J399  | 381.6 | 203   | 84.9615  | 0 | Open | ; |
| P933 | J371  | J23   | 130.5 | 305   | 87.9469  | 0 | Open | ; |
| P934 | J23   | J385  | 18.46 | 254   | 102.9935 | 0 | Open | ; |
| P935 | J385  | J22   | 152.1 | 305   | 100.0547 | 0 | Open | ; |
| P937 | J385  | J251  | 198.1 | 254   | 74.2779  | 0 | Open | ; |
| P938 | J251  | J257  | 169   | 254   | 74.4755  | 0 | Open | ; |
| P939 | J26   | J25   | 248.8 | 152   | 95.7893  | 0 | Open | ; |
| P94  | J123  | J145  | 51.35 | 305   | 139.0835 | 0 | Open | ; |
| P940 | J25   | J27   | 188   | 152   | 99.2821  | 0 | Open | ; |
| P941 | J27   | J30   | 142.6 | 152   | 79.3728  | 0 | Open | ; |
| P942 | J26   | J27   | 85.08 | 152   | 83.5947  | 0 | Open | ; |

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|      |       |       |       |       |          |   |      |   |
|------|-------|-------|-------|-------|----------|---|------|---|
| P943 | J81   | J28   | 84.21 | 76    | 86.7748  | 0 | Open | ; |
| P944 | J26   | J31   | 59.58 | 254   | 82.353   | 0 | Open | ; |
| P946 | J30   | J31   | 143   | 102   | 98.061   | 0 | Open | ; |
| P947 | J28   | J32   | 122.4 | 152   | 76.8045  | 0 | Open | ; |
| P948 | J32   | J29   | 74.71 | 152   | 104.8491 | 0 | Open | ; |
| P949 | J31   | J35   | 24.39 | 254   | 92.687   | 0 | Open | ; |
| P95  | J140  | J145  | 50.7  | 305   | 118.4307 | 0 | Open | ; |
| P951 | J257  | J37   | 338.8 | 254   | 94.7131  | 0 | Open | ; |
| P953 | J37   | J35   | 495.7 | 254   | 85.4054  | 0 | Open | ; |
| P954 | J36   | J34   | 294.1 | 203   | 78.6689  | 0 | Open | ; |
| P955 | J34   | J33   | 131.7 | 102   | 85.1813  | 0 | Open | ; |
| P956 | J34   | J38   | 115.2 | 152   | 68.2529  | 0 | Open | ; |
| P957 | J38   | J33   | 51.05 | 152   | 98.1514  | 0 | Open | ; |
| P958 | J38   | J32   | 122.4 | 102   | 105.3081 | 0 | Open | ; |
| P959 | J33   | J28   | 123.4 | 102   | 98.2207  | 0 | Open | ; |
| P96  | J414  | J417  | 53.72 | 254   | 87.9028  | 0 | Open | ; |
| P961 | J444  | J366  | 234.6 | 203   | 85.6539  | 0 | Open | ; |
| P962 | J6    | J1058 | 49.83 | 152   | 90.7478  | 0 | Open | ; |
| P963 | J366  | J205  | 93.54 | 203   | 85.5303  | 0 | Open | ; |
| P964 | J205  | J369  | 129.9 | 152   | 96.2637  | 0 | Open | ; |
| P965 | J205  | J367  | 135.1 | 203   | 93.9427  | 0 | Open | ; |
| P966 | J367  | J206  | 31.32 | 203   | 82.5088  | 0 | Open | ; |
| P967 | J206  | J200  | 207.5 | 203   | 82.1071  | 0 | Open | ; |
| P968 | J200  | J198  | 68.17 | 102   | 78.3964  | 0 | Open | ; |
| P969 | J200  | J1154 | 149.2 | 203   | 86.2672  | 0 | Open | ; |
| P97  | J154  | J155  | 24.41 | 610   | 88.8953  | 0 | Open | ; |
| P970 | J1154 | J199  | 165   | 203   | 87.7951  | 0 | Open | ; |
| P971 | J367  | J370  | 136.9 | 152   | 77.8295  | 0 | Open | ; |
| P972 | J370  | J1158 | 219.4 | 152   | 82.6695  | 0 | Open | ; |
| P973 | J1158 | J365  | 164.7 | 203   | 71.9319  | 0 | Open | ; |
| P974 | J365  | J444  | 186.4 | 203   | 72.7187  | 0 | Open | ; |
| P975 | J369  | J365  | 159.6 | 152   | 74.7236  | 0 | Open | ; |
| P976 | J359  | J358  | 83.33 | 76    | 83.2023  | 0 | Open | ; |
| P977 | J89   | J91   | 45.98 | 102   | 102.4317 | 0 | Open | ; |
| P978 | J358  | J355  | 179   | 76    | 78.8556  | 0 | Open | ; |
| P98  | J156  | J154  | 174.5 | 610   | 71.7523  | 0 | Open | ; |
| P981 | J361  | J351  | 36.19 | 76    | 80.2162  | 0 | Open | ; |
| P982 | J351  | J349  | 87.24 | 203   | 98.5114  | 0 | Open | ; |
| P983 | J349  | J352  | 180.2 | 101.6 | 91.8964  | 0 | Open | ; |
| P984 | J349  | J381  | 16.03 | 101.6 | 108.9555 | 0 | Open | ; |
| P986 | J381  | J348  | 229.5 | 101.6 | 87.084   | 0 | Open | ; |
| P987 | J348  | J232  | 94.56 | 101.6 | 96.4064  | 0 | Open | ; |

|       |       |       |       |       |          |   |        |   |
|-------|-------|-------|-------|-------|----------|---|--------|---|
| P988  | J232  | J382  | 9.74  | 101.6 | 102.5172 | 0 | Open   | ; |
| P989  | J1153 | J1155 | 91.59 | 51    | 82.0703  | 0 | Open   | ; |
| P99   | J110  | J109  | 452.4 | 508   | 96.6382  | 0 | Open   | ; |
| P990  | J1155 | J1154 | 78.87 | 102   | 85.7877  | 0 | Open   | ; |
| P991  | J214  | J202  | 20.25 | 203   | 74.3133  | 0 | Open   | ; |
| P992  | J202  | J314  | 69.15 | 203   | 80.6408  | 0 | Open   | ; |
| P993  | J314  | J199  | 63.52 | 203   | 80.232   | 0 | Open   | ; |
| P994  | J199  | J1157 | 115.4 | 203   | 83.0944  | 0 | Open   | ; |
| P995  | J1157 | J201  | 229   | 152   | 82.4996  | 0 | Open   | ; |
| P996  | J332  | J201  | 10.22 | 203   | 84.5761  | 0 | Open   | ; |
| P997  | J201  | J308  | 154.9 | 203   | 96.6174  | 0 | Open   | ; |
| P998  | J308  | J204  | 108   | 203   | 90.6408  | 0 | Open   | ; |
| P999  | J203  | J341  | 81.67 | 254   | 68.7046  | 0 | Open   | ; |
| 1     | J32   | N2    | 328.7 | 102   | 120      | 0 | Open   | ; |
| 2     | N11   | N1    | 329   | 152   | 120      | 0 | Open   | ; |
| 3     | N1    | N7    | 113.1 | 102   | 120      | 0 | Open   | ; |
| 4     | N7    | N6    | 310.4 | 102   | 120      | 0 | Open   | ; |
| 5     | N6    | N5    | 231.1 | 102   | 120      | 0 | Open   | ; |
| 6     | N7    | N8    | 218.9 | 102   | 120      | 0 | Open   | ; |
| 7     | N8    | N4    | 259.4 | 102   | 120      | 0 | Open   | ; |
| 8     | N9    | N5    | 470.5 | 102   | 120      | 0 | Open   | ; |
| 9     | N4    | N3    | 244.5 | 102   | 120      | 0 | Open   | ; |
| 10    | N1    | N3    | 393.4 | 102   | 120      | 0 | Open   | ; |
| 11    | N3    | N2    | 314.3 | 102   | 120      | 0 | Open   | ; |
| 12    | N2    | N10   | 240.7 | 102   | 120      | 0 | Open   | ; |
| 13    | N10   | N9    | 293.7 | 102   | 120      | 0 | Open   | ; |
| 14    | N4    | N9    | 221.8 | 102   | 120      | 0 | Open   | ; |
| N1000 | J341  | J204  | 109.3 | 100   | 120      | 0 | Closed | ; |
| N1024 | J580  | J278  | 375.6 | 102   | 120      | 0 | Open   | ; |
| N115  | J408  | J435  | 99.88 | 102   | 120      | 0 | Open   | ; |
| N22   | J192  | J159  | 567.3 | 711   | 120      | 0 | Open   | ; |
| N235  | J336  | J337  | 92.74 | 203   | 120      | 0 | Open   | ; |
| N295  | J435  | J10   | 133.2 | 100   | 120      | 0 | Closed | ; |
| N296  | J432  | J433  | 231.9 | 100   | 120      | 0 | Closed | ; |
| N397  | J332  | J301  | 13.16 | 356   | 120      | 0 | Open   | ; |
| N445  | J417  | J421  | 7.8   | 406   | 120      | 0 | Open   | ; |
| N465  | J421  | J14   | 18.2  | 356   | 120      | 0 | Open   | ; |
| N785  | J190  | J215  | 184.7 | 100   | 120      | 0 | Closed | ; |
| N787  | T3    | J216  | 127.1 | 203   | 120      | 0 | Open   | ; |
| N788  | J216  | J227  | 107.9 | 254   | 120      | 0 | Open   | ; |
| N791  | J227  | J238  | 82.5  | 254   | 120      | 0 | Open   | ; |
| N796  | J256  | J238  | 22.42 | 254   | 120      | 0 | Open   | ; |

|      |       |      |       |     |     |   |      |   |
|------|-------|------|-------|-----|-----|---|------|---|
| N892 | J414  | J13  | 30.39 | 356 | 120 | 0 | Open | ; |
| N96  | J414  | J417 | 53.72 | 406 | 120 | 0 | Open | ; |
| N995 | J1157 | J201 | 229   | 305 | 120 | 0 | Open | ; |
| N996 | J332  | J201 | 10.22 | 356 | 120 | 0 | Open | ; |

## [PUMPS]

| ;ID  | Node1 | Node2 | Parameters |
|------|-------|-------|------------|
| PU1  | J285  | J273  | HEAD 8 ;   |
| PU2  | J280  | J269  | HEAD 8 ;   |
| PU3  | J276  | J274  | HEAD 8 ;   |
| PU4  | J299  | J292  | HEAD 9 ;   |
| PU5  | J300  | J256  | HEAD 9 ;   |
| PU6  | J289  | J415  | HEAD 10 ;  |
| PU7  | J290  | J291  | HEAD 10 ;  |
| PU8  | J301  | J304  | HEAD 9 ;   |
| PU9  | J302  | J306  | HEAD 9 ;   |
| PU10 | J307  | J317  | HEAD 11 ;  |
| PU11 | J309  | J323  | HEAD 11 ;  |
| PU12 | J285  | J273  | HEAD 8b ;  |
| PU13 | J285  | J273  | HEAD 11a ; |

## [VALVES]

| ;ID | Node1 | Node2 | Diameter | Type | Setting | MinorLoss |
|-----|-------|-------|----------|------|---------|-----------|
| v1  | J35   | J88   | 203.2    | PRV  | 44.4    | 0 ;       |
| V45 | J253  | J130  | 152.4    | PRV  | 40      | 0 ;       |
| V47 | J129  | J169  | 101.6    | PRV  | 40      | 0 ;       |
| V2  | J14   | J422  | 254      | TCV  | 0       | 0 ;       |
| N15 | J145  | N11   | 12       | PRV  | 59.4    | 0 ;       |

## [DEMANDS]

| ;Junction | Demand | Pattern | Category |
|-----------|--------|---------|----------|
|-----------|--------|---------|----------|

## [STATUS]

| ;ID  | Status/Setting |
|------|----------------|
| PU13 | Closed         |
| v1   | Open           |
| V45  | Open           |
| V47  | Open           |
| V2   | Open           |
| N15  | Open           |

## [PATTERNS]

| ID       | Multipliers |        |        |      |        |        |
|----------|-------------|--------|--------|------|--------|--------|
| ;        |             |        |        |      |        |        |
| DMA1_pat | 0.5692      | 0.4647 | 0.4385 | 0.36 | 0.3098 | 0.3345 |
| DMA1_pat | 0.3847      | 0.4715 | 0.5501 | 0.68 | 0.7036 | 0.6709 |
| DMA1_pat | 0.7969      | 0.7199 | 0.7706 | 0.74 | 0.8148 | 0.7243 |
| DMA1_pat | 0.807       | 0.7793 | 0.8668 | 0.74 | 0.6704 | 0.6324 |
| DMA1_pat | 0.5225      | 0.5067 | 0.4456 | 0.45 | 0.4755 | 0.5339 |
| DMA1_pat | 0.6625      | 0.6224 | 0.676  | 0.73 | 0.8031 | 0.7014 |
| DMA1_pat | 0.6934      | 0.6538 | 0.6214 | 0.65 | 0.5719 | 0.579  |
| DMA1_pat | 0.5821      | 0.7117 | 0.7045 | 0.67 | 0.7417 | 0.6922 |
| DMA1_pat | 0.7271      | 0.6192 | 0.463  | 0.45 | 0.3093 | 0.2824 |
| DMA1_pat | 0.4333      | 0.4067 | 0.545  | 0.7  | 0.7399 | 0.6434 |
| DMA1_pat | 0.6809      | 0.6911 | 0.6773 | 0.63 | 0.6267 | 0.7143 |
| DMA1_pat | 0.6819      | 0.7883 | 0.7578 | 0.79 | 0.802  | 0.8456 |
| DMA1_pat | 0.6049      | 0.4436 | 0.5132 | 0.36 | 0.3178 | 0.4639 |
| DMA1_pat | 0.3957      | 0.6415 | 0.6711 | 0.67 | 0.7946 | 0.6746 |
| DMA1_pat | 0.7543      | 0.8084 | 0.7137 | 0.69 | 0.6812 | 0.5496 |
| DMA1_pat | 0.6822      | 0.5698 | 0.7433 | 0.83 | 0.6789 | 0.7463 |
| DMA1_pat | 0.6013      | 0.5035 | 0.5191 | 0.36 | 0.2992 | 0.4532 |
| DMA1_pat | 0.4296      | 0.5395 | 0.8963 | 0.9  | 0.6826 | 0.5799 |
| DMA1_pat | 0.429       | 0.4201 | 0.6294 | 0.69 | 0.6706 | 0.6189 |
| DMA1_pat | 0.6826      | 0.8329 | 0.9028 | 0.82 | 0.8495 | 0.691  |
| DMA1_pat | 0.7163      | 0.5478 | 0.5335 | 0.42 | 0.356  | 0.3381 |
| DMA1_pat | 0.4524      | 0.5099 | 0.5646 | 0.76 | 0.6216 | 0.6782 |
| DMA1_pat | 0.6929      | 0.6393 | 0.6199 | 0.66 | 0.6563 | 0.6318 |
| DMA1_pat | 0.6041      | 0.7039 | 0.7725 | 0.89 | 0.8833 | 0.752  |
| DMA1_pat | 0.7141      | 0.4579 | 0.4465 | 0.43 | 0.4018 | 0.4331 |
| DMA1_pat | 0.4699      | 0.5223 | 0.5908 | 0.75 | 0.77   | 0.6448 |
| DMA1_pat | 0.7321      | 0.7095 | 0.5481 | 0.58 | 0.5924 | 0.6245 |
| DMA1_pat | 0.5597      | 0.7669 | 0.717  | 0.77 | 0.9045 | 0.8575 |
| ;        |             |        |        |      |        |        |
| DMA2_pat | 0.6184      | 0.4539 | 0.4447 | 0.34 | 0.3158 | 0.3132 |
| DMA2_pat | 0.4145      | 0.4487 | 0.4987 | 0.58 | 0.6842 | 0.7276 |
| DMA2_pat | 0.6697      | 0.7921 | 0.6684 | 0.82 | 0.7711 | 0.8303 |
| DMA2_pat | 0.8079      | 0.7934 | 0.8355 | 0.84 | 0.6776 | 0.6618 |
| DMA2_pat | 0.5677      | 0.4708 | 0.4708 | 0.43 | 0.4282 | 0.474  |
| DMA2_pat | 0.5795      | 0.6231 | 0.6839 | 0.77 | 0.7712 | 0.7957 |
| DMA2_pat | 0.6625      | 0.736  | 0.7115 | 0.6  | 0.6349 | 0.6167 |
| DMA2_pat | 0.5816      | 0.5965 | 0.7009 | 0.65 | 0.7158 | 0.7318 |
| DMA2_pat | 0.6811      | 0.7337 | 0.499  | 0.37 | 0.3156 | 0.2765 |
| DMA2_pat | 0.348       | 0.4612 | 0.5287 | 0.63 | 0.6689 | 0.7647 |
| DMA2_pat | 0.6662      | 0.6514 | 0.7566 | 0.56 | 0.6555 | 0.6447 |

|          |        |        |        |      |        |        |
|----------|--------|--------|--------|------|--------|--------|
| DMA2_pat | 0.7161 | 0.8402 | 0.7714 | 0.79 | 0.8483 | 0.8213 |
| DMA2_pat | 0.6652 | 0.5016 | 0.4929 | 0.42 | 0.3611 | 0.438  |
| DMA2_pat | 0.3941 | 0.6542 | 0.6059 | 0.81 | 0.7695 | 0.6432 |
| DMA2_pat | 0.697  | 0.6762 | 0.708  | 0.71 | 0.7058 | 0.539  |
| DMA2_pat | 0.5807 | 0.5653 | 0.7541 | 0.83 | 0.6937 | 0.7936 |
| DMA2_pat | 0.7519 | 0.508  | 0.4853 | 0.38 | 0.3371 | 0.3945 |
| DMA2_pat | 0.4841 | 0.6419 | 0.8128 | 0.85 | 0.6825 | 0.5929 |
| DMA2_pat | 0.4255 | 0.4196 | 0.5833 | 0.62 | 0.5869 | 0.563  |
| DMA2_pat | 0.6598 | 0.8116 | 0.8116 | 0.88 | 0.8582 | 0.857  |
| DMA2_pat | 0.6704 | 0.5742 | 0.5022 | 0.43 | 0.3736 | 0.3544 |
| DMA2_pat | 0.4673 | 0.4661 | 0.5935 | 0.72 | 0.5863 | 0.5863 |
| DMA2_pat | 0.6812 | 0.6475 | 0.6896 | 0.72 | 0.7076 | 0.6824 |
| DMA2_pat | 0.6607 | 0.734  | 0.8061 | 0.8  | 0.8421 | 0.7124 |
| DMA2_pat | 0.5943 | 0.4652 | 0.4943 | 0.45 | 0.3268 | 0.5129 |
| DMA2_pat | 0.514  | 0.5257 | 0.5826 | 0.6  | 0.7792 | 0.6629 |
| DMA2_pat | 0.6827 | 0.7292 | 0.5896 | 0.6  | 0.5885 | 0.6594 |
| DMA2_pat | 0.6257 | 0.6978 | 0.7827 | 0.82 | 0.9292 | 0.7897 |

;

|          |        |        |        |      |        |        |
|----------|--------|--------|--------|------|--------|--------|
| DMA3_pat | 0.5445 | 0.4813 | 0.4221 | 0.36 | 0.3235 | 0.359  |
| DMA3_pat | 0.4103 | 0.4734 | 0.5602 | 0.67 | 0.7536 | 0.7299 |
| DMA3_pat | 0.6707 | 0.7338 | 0.7062 | 0.76 | 0.7141 | 0.8364 |
| DMA3_pat | 0.8719 | 0.7378 | 0.7259 | 0.75 | 0.6707 | 0.7338 |
| DMA3_pat | 0.587  | 0.4263 | 0.4427 | 0.41 | 0.4329 | 0.4919 |
| DMA3_pat | 0.5542 | 0.6788 | 0.7543 | 0.74 | 0.7936 | 0.6821 |
| DMA3_pat | 0.6952 | 0.646  | 0.5936 | 0.6  | 0.6395 | 0.646  |
| DMA3_pat | 0.6428 | 0.6821 | 0.728  | 0.68 | 0.692  | 0.7575 |
| DMA3_pat | 0.7141 | 0.702  | 0.5043 | 0.4  | 0.3147 | 0.2864 |
| DMA3_pat | 0.4196 | 0.4317 | 0.4962 | 0.7  | 0.589  | 0.6939 |
| DMA3_pat | 0.6939 | 0.7665 | 0.6939 | 0.58 | 0.706  | 0.702  |
| DMA3_pat | 0.6657 | 0.823  | 0.7383 | 0.86 | 0.815  | 0.7101 |
| DMA3_pat | 0.606  | 0.4855 | 0.4554 | 0.39 | 0.3683 | 0.4118 |
| DMA3_pat | 0.4085 | 0.6629 | 0.6027 | 0.7  | 0.6596 | 0.6194 |
| DMA3_pat | 0.7098 | 0.8103 | 0.7634 | 0.82 | 0.7634 | 0.5993 |
| DMA3_pat | 0.6797 | 0.606  | 0.6897 | 0.81 | 0.7031 | 0.6663 |
| DMA3_pat | 0.6227 | 0.5745 | 0.4541 | 0.37 | 0.3303 | 0.4404 |
| DMA3_pat | 0.406  | 0.6193 | 0.8911 | 0.95 | 0.7397 | 0.5642 |
| DMA3_pat | 0.4576 | 0.4025 | 0.6709 | 0.65 | 0.5917 | 0.5573 |
| DMA3_pat | 0.6227 | 0.8257 | 0.8911 | 0.85 | 0.7534 | 0.7706 |
| DMA3_pat | 0.7455 | 0.5927 | 0.4883 | 0.38 | 0.3355 | 0.3765 |
| DMA3_pat | 0.4473 | 0.5629 | 0.5256 | 0.72 | 0.6374 | 0.5815 |
| DMA3_pat | 0.6747 | 0.6672 | 0.6374 | 0.64 | 0.671  | 0.6859 |
| DMA3_pat | 0.6001 | 0.7306 | 0.8499 | 0.87 | 0.8424 | 0.7418 |

|          |        |        |        |      |        |        |
|----------|--------|--------|--------|------|--------|--------|
| DMA3_pat | 0.6642 | 0.5278 | 0.5134 | 0.46 | 0.359  | 0.4775 |
| DMA3_pat | 0.5278 | 0.5637 | 0.6103 | 0.64 | 0.8006 | 0.718  |
| DMA3_pat | 0.6139 | 0.6067 | 0.6211 | 0.61 | 0.718  | 0.5744 |
| DMA3_pat | 0.5816 | 0.6678 | 0.6786 | 0.92 | 0.8258 | 0.7252 |
| ;        |        |        |        |      |        |        |
| DMA4_pat | 0.5245 | 0.4486 | 0.4367 | 0.32 | 0.318  | 0.3275 |
| DMA4_pat | 0.4248 | 0.432  | 0.5744 | 0.66 | 0.6907 | 0.7405 |
| DMA4_pat | 0.7619 | 0.7642 | 0.7191 | 0.69 | 0.8283 | 0.8283 |
| DMA4_pat | 0.7453 | 0.8093 | 0.8307 | 0.7  | 0.7737 | 0.6503 |
| DMA4_pat | 0.4973 | 0.4503 | 0.4386 | 0.43 | 0.4268 | 0.5326 |
| DMA4_pat | 0.6344 | 0.7088 | 0.7636 | 0.72 | 0.7616 | 0.7949 |
| DMA4_pat | 0.7695 | 0.6266 | 0.5991 | 0.58 | 0.6011 | 0.5933 |
| DMA4_pat | 0.5678 | 0.5933 | 0.6285 | 0.77 | 0.699  | 0.8067 |
| DMA4_pat | 0.7314 | 0.6664 | 0.5341 | 0.4  | 0.3248 | 0.2574 |
| DMA4_pat | 0.4234 | 0.4379 | 0.5485 | 0.69 | 0.6135 | 0.7506 |
| DMA4_pat | 0.7723 | 0.6736 | 0.6953 | 0.66 | 0.5798 | 0.6856 |
| DMA4_pat | 0.6712 | 0.8324 | 0.7386 | 0.88 | 0.7506 | 0.6808 |
| DMA4_pat | 0.6721 | 0.4879 | 0.5304 | 0.42 | 0.3462 | 0.4211 |
| DMA4_pat | 0.4676 | 0.5789 | 0.6599 | 0.71 | 0.7206 | 0.6194 |
| DMA4_pat | 0.7186 | 0.7126 | 0.7632 | 0.71 | 0.666  | 0.5263 |
| DMA4_pat | 0.6296 | 0.6336 | 0.7166 | 0.77 | 0.7611 | 0.7692 |
| DMA4_pat | 0.7166 | 0.5845 | 0.4998 | 0.4  | 0.3119 | 0.4523 |
| DMA4_pat | 0.4378 | 0.6072 | 0.824  | 0.83 | 0.7456 | 0.6464 |
| DMA4_pat | 0.4192 | 0.4647 | 0.5907 | 0.64 | 0.5927 | 0.6609 |
| DMA4_pat | 0.7043 | 0.7435 | 0.7518 | 0.81 | 0.8757 | 0.696  |
| DMA4_pat | 0.6601 | 0.5849 | 0.4989 | 0.43 | 0.3419 | 0.3483 |
| DMA4_pat | 0.4688 | 0.5204 | 0.5311 | 0.64 | 0.6451 | 0.5806 |
| DMA4_pat | 0.6881 | 0.7311 | 0.7332 | 0.66 | 0.6601 | 0.6429 |
| DMA4_pat | 0.6214 | 0.7526 | 0.787  | 0.81 | 0.8407 | 0.8214 |
| DMA4_pat | 0.5928 | 0.4738 | 0.4613 | 0.46 | 0.3736 | 0.4467 |
| DMA4_pat | 0.4571 | 0.4759 | 0.6513 | 0.74 | 0.7264 | 0.7076 |
| DMA4_pat | 0.6617 | 0.645  | 0.6387 | 0.62 | 0.6617 | 0.6429 |
| DMA4_pat | 0.6325 | 0.7139 | 0.7786 | 0.74 | 0.931  | 0.7723 |
| ;        |        |        |        |      |        |        |
| DMA5_pat | 0.5361 | 0.4415 | 0.4073 | 0.29 | 0.3232 | 0.3311 |
| DMA5_pat | 0.3679 | 0.5046 | 0.5886 | 0.62 | 0.7253 | 0.7384 |
| DMA5_pat | 0.77   | 0.6938 | 0.6938 | 0.76 | 0.8146 | 0.8068 |
| DMA5_pat | 0.8514 | 0.8146 | 0.7673 | 0.71 | 0.7989 | 0.6412 |
| DMA5_pat | 0.5555 | 0.496  | 0.4541 | 0.44 | 0.4982 | 0.5312 |
| DMA5_pat | 0.6106 | 0.6018 | 0.745  | 0.75 | 0.6899 | 0.6811 |
| DMA5_pat | 0.6547 | 0.6811 | 0.6282 | 0.6  | 0.6392 | 0.615  |
| DMA5_pat | 0.6569 | 0.5885 | 0.615  | 0.74 | 0.8266 | 0.7142 |

|          |        |        |        |      |        |        |
|----------|--------|--------|--------|------|--------|--------|
| DMA5_pat | 0.7669 | 0.7048 | 0.486  | 0.37 | 0.3078 | 0.3078 |
| DMA5_pat | 0.4077 | 0.4482 | 0.505  | 0.68 | 0.6643 | 0.7399 |
| DMA5_pat | 0.694  | 0.6427 | 0.7723 | 0.55 | 0.5887 | 0.7588 |
| DMA5_pat | 0.6535 | 0.8263 | 0.8182 | 0.82 | 0.8128 | 0.6751 |
| DMA5_pat | 0.6553 | 0.4582 | 0.5202 | 0.35 | 0.3431 | 0.4383 |
| DMA5_pat | 0.4582 | 0.6265 | 0.6685 | 0.75 | 0.7195 | 0.6973 |
| DMA5_pat | 0.7682 | 0.8036 | 0.6331 | 0.66 | 0.7283 | 0.5933 |
| DMA5_pat | 0.673  | 0.6663 | 0.6066 | 0.8  | 0.7217 | 0.653  |
| DMA5_pat | 0.6371 | 0.5566 | 0.559  | 0.42 | 0.3055 | 0.4287 |
| DMA5_pat | 0.4169 | 0.5969 | 0.7793 | 0.83 | 0.7437 | 0.6774 |
| DMA5_pat | 0.4571 | 0.4145 | 0.5495 | 0.58 | 0.6182 | 0.604  |
| DMA5_pat | 0.6679 | 0.8195 | 0.7816 | 0.9  | 0.8787 | 0.7816 |
| DMA5_pat | 0.7026 | 0.5707 | 0.454  | 0.43 | 0.3678 | 0.3526 |
| DMA5_pat | 0.4439 | 0.5022 | 0.5986 | 0.73 | 0.6899 | 0.5834 |
| DMA5_pat | 0.766  | 0.6138 | 0.6442 | 0.65 | 0.6442 | 0.6239 |
| DMA5_pat | 0.5935 | 0.7609 | 0.7634 | 0.88 | 0.8421 | 0.7939 |
| DMA5_pat | 0.5974 | 0.4832 | 0.4492 | 0.43 | 0.357  | 0.4468 |
| DMA5_pat | 0.5002 | 0.5755 | 0.6678 | 0.75 | 0.7552 | 0.6289 |
| DMA5_pat | 0.7212 | 0.6629 | 0.5415 | 0.56 | 0.5828 | 0.6702 |
| DMA5_pat | 0.6727 | 0.6678 | 0.7552 | 0.88 | 0.8475 | 0.7892 |
| ;        |        |        |        |      |        |        |
| ENERGIA  | 0.0672 | 0.0672 | 0.0672 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.1094 | 0.1094 | 0.11 | 0.2768 | 0.2768 |
| ENERGIA  | 0.2768 | 0.2768 | 0.2768 | 0.28 | 0.2768 | 0.1094 |
| ENERGIA  | 0.1094 | 0.1094 | 0.1094 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.0672 | 0.0672 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.1094 | 0.1094 | 0.11 | 0.2768 | 0.2768 |
| ENERGIA  | 0.2768 | 0.2768 | 0.2768 | 0.28 | 0.2768 | 0.1094 |
| ENERGIA  | 0.1094 | 0.1094 | 0.1094 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.0672 | 0.0672 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.1094 | 0.1094 | 0.11 | 0.2768 | 0.2768 |
| ENERGIA  | 0.2768 | 0.2768 | 0.2768 | 0.28 | 0.2768 | 0.1094 |
| ENERGIA  | 0.1094 | 0.1094 | 0.1094 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.0672 | 0.0672 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.1094 | 0.1094 | 0.11 | 0.2768 | 0.2768 |
| ENERGIA  | 0.2768 | 0.2768 | 0.2768 | 0.28 | 0.2768 | 0.1094 |
| ENERGIA  | 0.1094 | 0.1094 | 0.1094 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.0672 | 0.0672 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.1094 | 0.1094 | 0.11 | 0.2768 | 0.2768 |
| ENERGIA  | 0.2768 | 0.2768 | 0.2768 | 0.28 | 0.2768 | 0.1094 |
| ENERGIA  | 0.1094 | 0.1094 | 0.1094 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.0672 | 0.0672 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.1094 | 0.1094 | 0.11 | 0.2768 | 0.2768 |
| ENERGIA  | 0.2768 | 0.2768 | 0.2768 | 0.28 | 0.2768 | 0.1094 |
| ENERGIA  | 0.1094 | 0.1094 | 0.1094 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA  | 0.0672 | 0.0672 | 0.0672 | 0.07 | 0.0672 | 0.0672 |

|         |        |        |        |      |        |        |
|---------|--------|--------|--------|------|--------|--------|
| ENERGIA | 0.0672 | 0.1094 | 0.1094 | 0.11 | 0.1094 | 0.1094 |
| ENERGIA | 0.1094 | 0.1094 | 0.1094 | 0.11 | 0.1094 | 0.1094 |
| ENERGIA | 0.1094 | 0.1094 | 0.0672 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA | 0.0672 | 0.0672 | 0.0672 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA | 0.0672 | 0.0672 | 0.0672 | 0.07 | 0.0672 | 0.0672 |
| ENERGIA | 0.0672 | 0.0672 | 0.0672 | 0.07 | 0.0672 | 0.1094 |
| ENERGIA | 0.1094 | 0.1094 | 0.1094 | 0.07 | 0.0672 | 0.0672 |

;

|     |      |
|-----|------|
| GHG | 1.04 |
|-----|------|

[CURVES]

| ;ID                                                                                  | X-Value | Y-Value |
|--------------------------------------------------------------------------------------|---------|---------|
| ;PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: |         |         |
| 8                                                                                    | 0       | 70      |
| 8                                                                                    | 60      | 50      |
| 8                                                                                    | 100     | 30      |
| ;PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: |         |         |
| 9                                                                                    | 0       | 90      |
| 9                                                                                    | 30      | 70      |
| 9                                                                                    | 50      | 30      |
| ;PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: |         |         |
| 10                                                                                   | 0       | 120     |
| 10                                                                                   | 30      | 110     |
| 10                                                                                   | 70      | 30      |
| ;PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: |         |         |
| 11                                                                                   | 0       | 90      |
| 11                                                                                   | 30      | 50      |
| 11                                                                                   | 40      | 10      |
| ;PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: |         |         |
| 8a                                                                                   | 0       | 70      |
| 8a                                                                                   | 30      | 50      |
| 8a                                                                                   | 50      | 30      |
| ;PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: |         |         |
| 10a                                                                                  | 0       | 120     |
| 10a                                                                                  | 15      | 110     |
| 10a                                                                                  | 35      | 30      |
| ;PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: |         |         |
| 11a                                                                                  | 0       | 90      |
| 11a                                                                                  | 15      | 50      |
| 11a                                                                                  | 20      | 10      |
| ;PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: |         |         |
| 8b                                                                                   | 0       | 84      |

|                                                                                      |      |     |
|--------------------------------------------------------------------------------------|------|-----|
| 8b                                                                                   | 60   | 60  |
| 8b                                                                                   | 100  | 36  |
| ;PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: |      |     |
| 9b                                                                                   | 0    | 108 |
| 9b                                                                                   | 30   | 84  |
| 9b                                                                                   | 50   | 36  |
| ;PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: PUMP: |      |     |
| 10b                                                                                  | 0    | 144 |
| 10b                                                                                  | 30   | 132 |
| 10b                                                                                  | 70   | 36  |
| ;RENDIMIENTO:                                                                        |      |     |
| REND75                                                                               | 0    | 75  |
| REND75                                                                               | 1000 | 75  |

[CONTROLS]

[RULES]

[ENERGY]

|                   |                        |
|-------------------|------------------------|
| Global Efficiency | 65                     |
| Global Price      | 40                     |
| Global Pattern    | GHG                    |
| Demand Charge     | 0                      |
| Pump              | PU1 Price 1            |
| Pump              | PU2 Price 1            |
| Pump              | PU3 Price 1            |
| Pump              | PU4 Price 1            |
| Pump              | PU5 Price 1            |
| Pump              | PU6 Price 1            |
| Pump              | PU7 Price 1            |
| Pump              | PU8 Price 1            |
| Pump              | PU9 Price 1            |
| Pump              | PU10 Price 1           |
| Pump              | PU11 Price 1           |
| Pump              | PU12 Efficiency REND75 |
| Pump              | PU12 Price 1           |
| Pump              | PU13 Efficiency REND75 |
| Pump              | PU13 Price 1           |

[EMITTERS]

;Junction Coefficient

## [QUALITY]

|       |          |
|-------|----------|
| ;Node | InitQual |
|-------|----------|

## [SOURCES]

|       |      |         |         |
|-------|------|---------|---------|
| ;Node | Type | Quality | Pattern |
|-------|------|---------|---------|

## [REACTIONS]

|                       |   |
|-----------------------|---|
| Order Bulk            | 1 |
| Order Tank            | 1 |
| Order Wall            | 1 |
| Global Bulk           | 0 |
| Global Wall           | 0 |
| Limiting Potential    | 0 |
| Roughness Correlation | 0 |

## [MIXING]

|       |       |
|-------|-------|
| ;Tank | Model |
|-------|-------|

## [TIMES]

|                    |          |
|--------------------|----------|
| Duration           | 24:00:00 |
| Hydraulic Timestep | 1:00     |
| Quality Timestep   | 0:05     |
| Pattern Timestep   | 1:00     |
| Pattern Start      | 0:00     |
| Report Timestep    | 1:00     |
| Report Start       | 0:00     |
| Start ClockTime    | 0:00     |
| Statistic          | NONE     |

## [REPORT]

|         |    |
|---------|----|
| Status  | No |
| Summary | No |
| Page    | 0  |

## [OPTIONS]

|                  |      |
|------------------|------|
| Units            | LPS  |
| Headloss         | H-W  |
| Specific Gravity | 1    |
| Viscosity        | 1    |
| Trials           | 100  |
| Accuracy         | 0.01 |
| CHECKFREQ        | 2    |

|                   |             |
|-------------------|-------------|
| MAXCHECK          | 10          |
| DAMPLIMIT         | 0           |
| Unbalanced        | Continue 10 |
| Pattern           | 1           |
| Demand Multiplier | 1           |
| Emitter Exponent  | 0.5         |
| Quality           | None mg/L   |
| Diffusivity       | 1           |
| Tolerance         | 0.01        |

## [COORDINATES]

| Node  | X-Coord    | Y-Coord |
|-------|------------|---------|
| J511  | -246643.52 | 150768  |
| J411  | -248212.98 | 148750  |
| J414  | -247493.99 | 148416  |
| J415  | -246594.18 | 149478  |
| J416  | -246486.73 | 149818  |
| J417  | -247408.47 | 148278  |
| J418  | -246985.61 | 148483  |
| J419  | -246866.83 | 148825  |
| J310  | -247788.57 | 148853  |
| J311  | -247845.59 | 148963  |
| J312  | -247850.34 | 149138  |
| J313  | -247802.83 | 149048  |
| J314  | -248553.52 | 149542  |
| J315  | -248634.29 | 149614  |
| J316  | -248943.12 | 149248  |
| J318  | -247964.37 | 148977  |
| J319  | -248030.89 | 148896  |
| J210  | -248791.08 | 149048  |
| J211  | -248900.36 | 149390  |
| J212  | -248672.3  | 149243  |
| J214  | -248495.29 | 148974  |
| J217  | -248681.81 | 149471  |
| J218  | -248767.33 | 149300  |
| J219  | -247413.22 | 150127  |
| J110  | -247921.61 | 147894  |
| J420  | -246919.09 | 148963  |
| J421  | -247060.44 | 148294  |
| J422  | -246957.1  | 148768  |
| J1153 | -247793.32 | 149509  |
| J1154 | -247988.12 | 149547  |

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|       |            |        |
|-------|------------|--------|
| J1155 | −247874.09 | 149552 |
| J425  | −246759.83 | 149576 |
| J426  | −246649.4  | 149729 |
| J1157 | −247870.26 | 149650 |
| J427  | −246649.4  | 149594 |
| J1158 | −247931.11 | 149438 |
| J428  | −247978.62 | 148383 |
| J429  | −248002.38 | 148297 |
| J320  | −247617.53 | 148915 |
| J321  | −247555.76 | 148763 |
| J322  | −247451.23 | 148768 |
| J324  | −247545.1  | 148625 |
| J1056 | −248271.79 | 148956 |
| J327  | −247684.04 | 148982 |
| J1058 | −246843.07 | 148050 |
| J328  | −247589.02 | 149058 |
| J329  | −247517.75 | 149086 |
| J220  | −247384.72 | 150017 |
| J221  | −247650.79 | 149357 |
| J225  | −249057.15 | 149172 |
| J226  | −249218.7  | 149029 |
| J50   | −247845.59 | 149276 |
| J51   | −247788.57 | 149366 |
| J53   | −247612.78 | 150640 |
| J54   | −247723.02 | 150717 |
| J128  | −247446.48 | 151143 |
| J55   | −247802.77 | 150140 |
| J129  | −247140.19 | 151214 |
| J56   | −247608.02 | 150250 |
| J57   | −247527.25 | 150155 |
| J58   | −247688.8  | 150388 |
| J59   | −247551.01 | 149960 |
| J1160 | −247379.97 | 148131 |
| J1161 | −247194.67 | 148226 |
| J431  | −247802.83 | 148088 |
| J432  | −247579.52 | 148160 |
| J433  | −247741.06 | 148236 |
| J434  | −247935.86 | 148488 |
| J435  | −248007.13 | 148107 |
| J436  | −247973.87 | 148231 |
| J438  | −248026.13 | 148644 |
| J1169 | −246120.89 | 148877 |

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|       |            |        |
|-------|------------|--------|
| J439  | −248030.89 | 148450 |
| J330  | −247636.53 | 149143 |
| J331  | −247598.52 | 149214 |
| J332  | −247538.97 | 149631 |
| J333  | −248368.22 | 149946 |
| J334  | −248262.89 | 150006 |
| J335  | −248506.01 | 149941 |
| J336  | −248648.55 | 149913 |
| J337  | −248857.6  | 149723 |
| J231  | −247037.88 | 148853 |
| J232  | −247132.9  | 148844 |
| J233  | −246827.31 | 149717 |
| J234  | −246913.17 | 149874 |
| J236  | −247281.3  | 150502 |
| J237  | −247408.47 | 150445 |
| J130  | −247698.3  | 151077 |
| J131  | −247109.52 | 151079 |
| J132  | −247199.42 | 150944 |
| J133  | −247280.19 | 150968 |
| J60   | −247484.49 | 150055 |
| J134  | −246919.09 | 150364 |
| J135  | −246995.51 | 149926 |
| J62   | −247650.79 | 150131 |
| J64   | −247565.26 | 150721 |
| J65   | −247446.94 | 150674 |
| J66   | −247612.78 | 150426 |
| J67   | −247630.99 | 150552 |
| J68   | −247855.09 | 150659 |
| J69   | −247950.11 | 150497 |
| J1170 | −246291.93 | 148882 |
| J441  | −246519.12 | 149644 |
| J444  | −248244.69 | 149157 |
| J341  | −248610.54 | 149799 |
| J344  | −246282.43 | 148739 |
| J345  | −246149.39 | 148739 |
| J347  | −246396.46 | 148749 |
| J348  | −247151.91 | 148725 |
| J349  | −247322.95 | 148853 |
| J241  | −247455.99 | 150274 |
| J242  | −247322.95 | 150226 |
| J243  | −247342.65 | 150153 |
| J244  | −247470.24 | 150364 |

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|      |            |        |
|------|------------|--------|
| J245 | −247551.24 | 150367 |
| J246 | −247037.88 | 150516 |
| J247 | −247170.87 | 150478 |
| J248 | −247033.12 | 150317 |
| J249 | −247208.92 | 150379 |
| J142 | −248363.47 | 148668 |
| J143 | −248558.27 | 148730 |
| J70  | −248011.88 | 150436 |
| J144 | −248696.06 | 148673 |
| J71  | −247888.66 | 150797 |
| J72  | −248040.39 | 150692 |
| J73  | −247796.64 | 150779 |
| J74  | −248078.4  | 150616 |
| J76  | −247851.85 | 150447 |
| J77  | −247969.12 | 150778 |
| J78  | −247912.1  | 149338 |
| J350 | −246111.38 | 149062 |
| J351 | −247417.98 | 148896 |
| J352 | −247223.17 | 149005 |
| J353 | −247351.46 | 149034 |
| J354 | −247541.51 | 148882 |
| J355 | −247305.84 | 148570 |
| J358 | −247246.93 | 148654 |
| J359 | −247170.91 | 148630 |
| J250 | −247299.19 | 150312 |
| J251 | −246796.64 | 150257 |
| J252 | −246486.73 | 150241 |
| J253 | −247436.98 | 151034 |
| J254 | −247565.26 | 151153 |
| J257 | −246638.77 | 150207 |
| J154 | −246391.71 | 147799 |
| J155 | −246500.98 | 147799 |
| J82  | −247893.1  | 149205 |
| J156 | −246301.43 | 147794 |
| J83  | −247940.61 | 149081 |
| J84  | −247189.27 | 150153 |
| J85  | −247201.54 | 150269 |
| J159 | −246692.34 | 147821 |
| J86  | −247256.43 | 150051 |
| J87  | −247056.88 | 150027 |
| J89  | −247341.96 | 151305 |
| J360 | −247227.93 | 148530 |

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|       |            |        |
|-------|------------|--------|
| J361  | −247398.97 | 148611 |
| J362  | −247408.47 | 149124 |
| J363  | −246532.83 | 149938 |
| J364  | −246649.4  | 149877 |
| J365  | −248230.44 | 149309 |
| J366  | −248344.47 | 149248 |
| J1208 | −247256.43 | 149157 |
| J367  | −248477.5  | 149400 |
| J369  | −248287.45 | 149362 |
| J160  | −246577    | 147813 |
| J161  | −246961.86 | 147675 |
| J162  | −246771.81 | 147514 |
| J163  | −247227.93 | 147803 |
| J164  | −246871.58 | 147675 |
| J91   | −247262.89 | 151306 |
| J165  | −246895.34 | 147770 |
| J166  | −246895.34 | 147556 |
| J167  | −246890.59 | 147433 |
| J94   | −245797.8  | 148364 |
| J95   | −247774.32 | 147884 |
| J96   | −247622.28 | 147951 |
| J97   | −247717.3  | 147965 |
| J976  | −248468    | 148706 |
| J571  | −247099.64 | 150635 |
| J572  | −247164.73 | 150717 |
| J573  | −247361.05 | 151208 |
| J574  | −247441.73 | 151243 |
| J575  | −247161.41 | 150858 |
| J576  | −246937.74 | 150539 |
| J370  | −248173.42 | 149447 |
| J371  | −246630.99 | 150055 |
| J372  | −249128.42 | 148934 |
| J373  | −249180.69 | 148844 |
| J374  | −248981.13 | 148934 |
| J375  | −249014.39 | 149091 |
| J376  | −249128.42 | 149067 |
| J377  | −248800.59 | 148901 |
| J1219 | −247660.29 | 147742 |
| J379  | −249275.71 | 148929 |
| J171  | −247332.45 | 147547 |
| J172  | −247199.42 | 147485 |
| J173  | −247332.45 | 147751 |

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|       |            |        |
|-------|------------|--------|
| J174  | −247109.14 | 147433 |
| J175  | −247085.39 | 147575 |
| J177  | −247622.28 | 147808 |
| J179  | −247774.32 | 147818 |
| J580  | −246686.28 | 150678 |
| J486  | −246995.11 | 150801 |
| J487  | −247066.57 | 150877 |
| J488  | −246974.55 | 150687 |
| J489  | −247080.64 | 150987 |
| J381  | −247322.95 | 148739 |
| J1223 | −248795.84 | 149191 |
| J382  | −247118.65 | 148948 |
| J384  | −247161.41 | 149214 |
| J385  | −246876.33 | 150098 |
| J180  | −247227.93 | 147571 |
| J181  | −247123.4  | 147699 |
| J1024 | −248287.45 | 148587 |
| J183  | −247408.47 | 147708 |
| J1025 | −248225.69 | 148469 |
| J186  | −247413.22 | 147628 |
| J187  | −247265.94 | 147623 |
| J188  | −247536.76 | 147566 |
| J189  | −247446.48 | 147561 |
| J490  | −246876.39 | 150754 |
| J491  | −247072.71 | 150785 |
| J492  | −246913.2  | 150858 |
| J493  | −247226.08 | 151055 |
| J494  | −246771.81 | 150668 |
| J495  | −246881.08 | 150616 |
| J496  | −246781.31 | 150512 |
| J497  | −246765.96 | 150803 |
| J498  | −246857.33 | 150483 |
| J500  | −246610.26 | 150920 |
| J499  | −246471.48 | 150926 |
| J501  | −246440.81 | 150864 |
| J502  | −246391.73 | 150956 |
| J503  | −246462.97 | 150782 |
| J504  | −246538.97 | 151036 |
| J394  | −246173.15 | 149604 |
| J509  | −246325.19 | 150806 |
| J399  | −246287.43 | 149889 |
| J401  | −246348.78 | 149809 |

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|      |            |        |
|------|------------|--------|
| J406 | −246201.54 | 149662 |
| J295 | −248026.13 | 149290 |
| J407 | −246424.96 | 149666 |
| J296 | −248116.41 | 149229 |
| J408 | −248235.19 | 148269 |
| J297 | −247536.76 | 149300 |
| J298 | −247712.55 | 149243 |
| J191 | −247479.74 | 147461 |
| J303 | −247897.85 | 148858 |
| J192 | −247033.12 | 147851 |
| J193 | −246957.1  | 147927 |
| J305 | −247817.08 | 148758 |
| J194 | −247493.99 | 147794 |
| J195 | −247584.27 | 147651 |
| J196 | −247375.21 | 147851 |
| J308 | −248005.22 | 149797 |
| J198 | −248311.21 | 149595 |
| J200 | −248149.67 | 149547 |
| J199 | −248250.62 | 149699 |
| J201 | −247741.42 | 149705 |
| J202 | −248591.53 | 149366 |
| J203 | −248734.07 | 149595 |
| J204 | −248306.46 | 149799 |
| J205 | −248472.75 | 149314 |
| J206 | −248339.72 | 149514 |
| J207 | −248477.5  | 149500 |
| J208 | −248843.35 | 149614 |
| J101 | −247926.36 | 148017 |
| J102 | −247812.33 | 147993 |
| J109 | −248045.14 | 148008 |
| J1   | −247075.89 | 147770 |
| J2   | −247536.76 | 147694 |
| J3   | −247265.94 | 148065 |
| J4   | −247508.25 | 148008 |
| J5   | −247641.28 | 148046 |
| J6   | −247042.63 | 147989 |
| J7   | −247170.91 | 147965 |
| J8   | −246990.36 | 148221 |
| J9   | −247109.14 | 148164 |
| J10  | −247926.36 | 148179 |
| J11  | −247836.08 | 148411 |
| J12  | −247579.52 | 148364 |

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|      |            |        |
|------|------------|--------|
| J13  | −247731.56 | 148554 |
| J14  | −247132.9  | 148464 |
| J15  | −246353.7  | 149571 |
| J16  | −246258.67 | 149438 |
| J17  | −246287.43 | 149729 |
| J18  | −246256.76 | 149552 |
| J19  | −246404    | 149460 |
| J20  | −246238.35 | 149779 |
| J21  | −246391.71 | 149975 |
| J22  | −246815.04 | 149975 |
| J23  | −246759.83 | 150012 |
| J25  | −246115.65 | 150361 |
| J26  | −246152.46 | 150251 |
| J27  | −246211.16 | 150440 |
| J28  | −246054.37 | 149419 |
| J29  | −245864.32 | 149732 |
| J30  | −246268.17 | 150374 |
| J31  | −246277.68 | 150260 |
| J32  | −245750.29 | 149485 |
| J33  | −246072.71 | 149564 |
| J34  | −245949.84 | 149699 |
| J35  | −246238.35 | 150098 |
| J36  | −245935.59 | 149808 |
| J37  | −246538.99 | 150084 |
| J38  | −245907.06 | 149601 |
| J24  | −249004.89 | 149756 |
| J39  | −249114.17 | 149808 |
| J40  | −248909.87 | 149034 |
| J123 | −245474.72 | 148321 |
| J140 | −245517.48 | 148445 |
| J141 | −245579.24 | 148364 |
| J157 | −245688.52 | 148316 |
| J158 | −245588.75 | 148202 |
| J168 | −245892.83 | 148397 |
| J170 | −246021.11 | 148354 |
| J176 | −245987.85 | 148511 |
| J178 | −245888.07 | 148483 |
| J184 | −245745.54 | 148459 |
| J185 | −246078.12 | 148573 |
| J190 | −246196.91 | 148540 |
| J197 | −246358.45 | 148554 |
| J213 | −246201.66 | 148402 |

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|      |            |        |
|------|------------|--------|
| J215 | −246258.67 | 148644 |
| J216 | −246448.72 | 148587 |
| J227 | −246557.37 | 148644 |
| J238 | −246698.48 | 148644 |
| J239 | −246524.74 | 148834 |
| J255 | −246396.46 | 148948 |
| J256 | −246771.81 | 148825 |
| J258 | −246567.5  | 148516 |
| J260 | −246296.68 | 148977 |
| J265 | −245959.34 | 148706 |
| J266 | −245945.09 | 148906 |
| J267 | −247465.49 | 148977 |
| J61  | −247916.86 | 150583 |
| J92  | −247857.99 | 150552 |
| J268 | −247992.88 | 149195 |
| J278 | −246662.53 | 150507 |
| J281 | −246458.22 | 150573 |
| J283 | −246524.74 | 150683 |
| J284 | −246330.38 | 150601 |
| J136 | −247256.76 | 151233 |
| J137 | −247185.16 | 147642 |
| J145 | −245403.45 | 148431 |
| J118 | −247765.96 | 150269 |
| J52  | −247052.13 | 148711 |
| J81  | −246164.73 | 149312 |
| J88  | −246072.71 | 149828 |
| J90  | −246581.76 | 150317 |
| J93  | −246379.46 | 150202 |
| J147 | −247275.44 | 150664 |
| J148 | −247798.07 | 151015 |
| J149 | −247790.5  | 151122 |
| J150 | −247913.2  | 151048 |
| J151 | −247527.25 | 151262 |
| J152 | −246802.77 | 151183 |
| J153 | −247600.32 | 151294 |
| J169 | −246888.66 | 151110 |
| J182 | −246833.44 | 150987 |
| J222 | −246833.44 | 151116 |
| J224 | −246735.29 | 151098 |
| J230 | −247956.14 | 148717 |
| J235 | −247969.12 | 148830 |
| J240 | −246342.65 | 150699 |

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|      |            |        |
|------|------------|--------|
| J269 | −246215.91 | 147789 |
| J273 | −246215.91 | 147936 |
| J274 | −246215.91 | 147666 |
| J276 | −246040.11 | 147666 |
| J280 | −246044.87 | 147794 |
| J285 | −246044.87 | 147936 |
| J287 | −246866.83 | 149091 |
| J288 | −246657.78 | 149110 |
| J289 | −246743.3  | 149238 |
| J290 | −246586.51 | 149205 |
| J291 | −246496.02 | 149417 |
| J292 | −246657.78 | 148792 |
| J299 | −246596.01 | 148948 |
| J300 | −246672.03 | 149015 |
| J301 | −247232.22 | 149650 |
| J302 | −247066.38 | 149723 |
| J304 | −247394.22 | 149827 |
| J306 | −247265.94 | 149903 |
| J307 | −246942.85 | 149566 |
| J309 | −247094.89 | 149614 |
| J317 | −247023.62 | 149362 |
| J323 | −247170.91 | 149409 |
| N1   | −245189    | 148680 |
| N2   | −245464.73 | 149322 |
| N3   | −245393.04 | 149016 |
| N4   | −245150.4  | 149047 |
| N5   | −244593.45 | 148912 |
| N6   | −244780.94 | 148776 |
| N7   | −245075.96 | 148680 |
| N8   | −244962.91 | 148867 |
| N9   | −244976.7  | 149185 |
| N10  | −245224.85 | 149342 |
| N11  | −245388.55 | 148447 |
| R1   | −245840.56 | 147794 |
| T3   | −246422.4  | 148460 |
| T1   | −249114.17 | 149951 |
| T7   | −247541.51 | 149419 |
| T6   | −247033.12 | 149124 |
| T5   | −247570.01 | 150863 |
| T2   | −246845.71 | 148674 |
| T4   | −246160.35 | 150738 |

## [VERTICES]

| ;Link | X-Coord    | Y-Coord |
|-------|------------|---------|
| PU12  | -246050.58 | 148013  |
| PU12  | -246206.4  | 148012  |
| PU13  | -246040.75 | 148102  |
| PU13  | -246214.96 | 148098  |

## [LABELS]

| ;X-Coord  | Y-Coord   | Label & Anchor Node       |
|-----------|-----------|---------------------------|
| -245964.1 | 147727.31 | "Source" R1               |
| -245651   | 147826.08 | "Pumping Station S1" J285 |
| -249171.2 | 150137.8  | "T1" T1                   |
| -247584.3 | 149585.05 | "T7" T7                   |
| -246904.8 | 148601.54 | "T2" T2                   |
| -246463   | 148382.99 | "T3" T3                   |
| -247755.3 | 150934.4  | "T5" T5                   |
| -246211.2 | 150948.66 | "T4" T4                   |
| -247071.1 | 149285.72 | "T6" T6                   |
| -246596   | 149105.18 | "S2" J300                 |
| -247551   | 149832.12 | "S4" J304                 |
| -247318.2 | 149585.05 | "S5" J323                 |
| -246486.7 | 149328.48 | "S3" J291                 |

## [BACKDROP]

|            |            |           |         |          |
|------------|------------|-----------|---------|----------|
| DIMENSIONS | -249469.32 | 147238.65 | -245210 | 151508.6 |
| UNITS      | Metros     |           |         |          |
| FILE       |            |           |         |          |
| OFFSET     | 0          | 0         |         |          |

## [END]

**Energy Recovery results**

## Example network

| No. | ID Link   | ID ER  | ER (kW·h)   | % ER        | Accum. ER (kW) | % Accum. ER |
|-----|-----------|--------|-------------|-------------|----------------|-------------|
| 1   | Pipe L22  | ER-22  | 1.28        | 38.65%      | 1.28           | 38.65%      |
| 2   | Pipe L124 | ER-124 | 0.71        | 21.44%      | 1.99           | 60.09%      |
| 3   | Pipe L123 | ER-123 | 0.65        | 19.60%      | 2.64           | 79.69%      |
| 4   | Pipe L12  | ER-12  | 0.61        | 18.56%      | 3.25           | 98.24%      |
| 5   | Pipe L134 | ER-134 | 0.05        | 1.52%       | 3.30           | 99.76%      |
| 6   | Pipe L43  | ER-43  | 0.01        | 0.24%       | 3.31           | 100.00%     |
|     |           |        | <b>3.31</b> | <b>100%</b> |                |             |

## Anytown network

| No. | ID Link | ID ER | ER (kW·h)      | % ER        | Accum. ER (kW) | % Accum. ER |
|-----|---------|-------|----------------|-------------|----------------|-------------|
| 1   | Pipe 80 | ER-80 | 195.01         | 0.18        | 195.01         | 18.43%      |
| 2   | Pipe 2  | ER-2  | 153.11         | 0.14        | 348.12         | 32.91%      |
| 3   | Pipe 12 | ER-12 | 129.93         | 0.12        | 478.05         | 45.19%      |
| 4   | Pipe 4  | ER-4  | 122.76         | 0.12        | 600.81         | 56.79%      |
| 5   | Pipe 6  | ER-6  | 102.53         | 0.10        | 703.34         | 66.48%      |
| 6   | Pipe 16 | ER-16 | 93.18          | 0.09        | 796.52         | 75.29%      |
| 7   | Pipe 78 | ER-78 | 86.64          | 0.08        | 883.16         | 83.48%      |
| 8   | Pipe 24 | ER-24 | 42.96          | 0.04        | 926.11         | 87.54%      |
| 9   | Pipe 20 | ER-20 | 40.68          | 0.04        | 966.79         | 91.39%      |
| 10  | Pipe 22 | ER-22 | 36.60          | 0.03        | 1003.39        | 94.85%      |
| 11  | Pipe 10 | ER-10 | 19.98          | 0.02        | 1023.37        | 96.73%      |
| 12  | Pipe 34 | ER-34 | 15.29          | 0.01        | 1038.66        | 98.18%      |
| 13  | Pipe 32 | ER-32 | 12.77          | 0.01        | 1051.43        | 99.39%      |
| 14  | Pipe 18 | ER-18 | 5.44           | 0.01        | 1056.87        | 99.90%      |
| 15  | Pipe 44 | ER-44 | 0.30           | 0.00        | 1057.17        | 99.93%      |
| 16  | Pipe 46 | ER-46 | 0.27           | 0.00        | 1057.44        | 99.96%      |
| 17  | Pipe 48 | ER-48 | 0.16           | 0.00        | 1057.61        | 99.97%      |
| 18  | Pipe 38 | ER-38 | 0.09           | 0.00        | 1057.70        | 99.98%      |
| 19  | Pipe 42 | ER-42 | 0.08           | 0.00        | 1057.78        | 99.99%      |
| 20  | Pipe 28 | ER-28 | 0.07           | 0.00        | 1057.86        | 100.00%     |
| 21  | Pipe 26 | ER-26 | 0.02           | 0.00        | 1057.88        | 100.00%     |
| 22  | Pipe 30 | ER-30 | 0.02           | 0.00        | 1057.90        | 100.00%     |
| 23  | Pipe 8  | ER-8  | 0.00           | 0.00        | 1057.91        | 100.00%     |
| 24  | Pipe 40 | ER-40 | 0.00           | 0.00        | 1057.91        | 100.00%     |
|     |         |       | <b>1057.91</b> | <b>100%</b> |                |             |

## Net3 network

| No. | ID Link  | ID ER  | ER (kW·h) | % ER | Accum. ER (kW) | % Accum. ER |
|-----|----------|--------|-----------|------|----------------|-------------|
| 1   | Pipe 233 | ER-233 | 1022.69   | 0.39 | 1022.69        | 38.60%      |
| 2   | Pipe 173 | ER-173 | 333.94    | 0.13 | 1356.63        | 51.21%      |
| 3   | Pipe 191 | ER-191 | 223.07    | 0.08 | 1579.71        | 59.63%      |
| 4   | Pipe 231 | ER-231 | 197.82    | 0.07 | 1777.52        | 67.09%      |
| 5   | Pipe 193 | ER-193 | 191.85    | 0.07 | 1969.37        | 74.33%      |
| 6   | Pipe 189 | ER-189 | 121.82    | 0.05 | 2091.19        | 78.93%      |
| 7   | Pipe 187 | ER-187 | 117.20    | 0.04 | 2208.40        | 83.36%      |
| 8   | Pipe 40  | ER-40  | 54.99     | 0.02 | 2263.39        | 85.43%      |
| 9   | Pipe 171 | ER-171 | 43.79     | 0.02 | 2307.18        | 87.09%      |
| 10  | Pipe 119 | ER-119 | 37.01     | 0.01 | 2344.18        | 88.48%      |
| 11  | Pipe 197 | ER-197 | 36.81     | 0.01 | 2380.99        | 89.87%      |
| 12  | Pipe 247 | ER-247 | 36.40     | 0.01 | 2417.39        | 91.25%      |
| 13  | Pipe 135 | ER-135 | 30.07     | 0.01 | 2447.46        | 92.38%      |
| 14  | Pipe 50  | ER-50  | 22.60     | 0.01 | 2470.06        | 93.23%      |
| 15  | Pipe 169 | ER-169 | 16.89     | 0.01 | 2486.95        | 93.87%      |
| 16  | Pipe 211 | ER-211 | 15.24     | 0.01 | 2502.19        | 94.45%      |
| 17  | Pipe 137 | ER-137 | 14.16     | 0.01 | 2516.35        | 94.98%      |
| 18  | Pipe 313 | ER-313 | 13.77     | 0.01 | 2530.12        | 95.50%      |
| 19  | Pipe 103 | ER-103 | 12.56     | 0.00 | 2542.68        | 95.97%      |
| 20  | Pipe 199 | ER-199 | 9.67      | 0.00 | 2552.34        | 96.34%      |

| No. | ID Link  | ID ER  | ER (kW·h)      | % ER        | Accum. ER (kW) | % Accum. ER |
|-----|----------|--------|----------------|-------------|----------------|-------------|
| 21  | Pipe 203 | ER-203 | 8.62           | 0.00        | 2560.97        | 96.66%      |
| 22  | Pipe 163 | ER-163 | 7.99           | 0.00        | 2568.95        | 96.97%      |
| 23  | Pipe 153 | ER-153 | 6.48           | 0.00        | 2575.44        | 97.21%      |
| 24  | Pipe 291 | ER-291 | 6.20           | 0.00        | 2581.64        | 97.44%      |
| 25  | Pipe 221 | ER-221 | 6.07           | 0.00        | 2587.71        | 97.67%      |
| 26  | Pipe 185 | ER-185 | 5.86           | 0.00        | 2593.57        | 97.90%      |
| 27  | Pipe 209 | ER-209 | 5.32           | 0.00        | 2598.89        | 98.10%      |
| 28  | Pipe 112 | ER-112 | 5.18           | 0.00        | 2604.07        | 98.29%      |
| 29  | Pipe 245 | ER-245 | 4.13           | 0.00        | 2608.20        | 98.45%      |
| 30  | Pipe 287 | ER-287 | 3.92           | 0.00        | 2612.12        | 98.60%      |
| 31  | Pipe 263 | ER-263 | 3.55           | 0.00        | 2615.66        | 98.73%      |
| 32  | Pipe 325 | ER-325 | 3.05           | 0.00        | 2618.71        | 98.84%      |
| 33  | Pipe 111 | ER-111 | 2.53           | 0.00        | 2621.24        | 98.94%      |
| 34  | Pipe 323 | ER-323 | 2.21           | 0.00        | 2623.45        | 99.02%      |
| 35  | Pipe 311 | ER-311 | 2.19           | 0.00        | 2625.64        | 99.11%      |
| 36  | Pipe 237 | ER-237 | 2.12           | 0.00        | 2627.76        | 99.19%      |
| 37  | Pipe 107 | ER-107 | 2.09           | 0.00        | 2629.85        | 99.26%      |
| 38  | Pipe 145 | ER-145 | 1.87           | 0.00        | 2631.73        | 99.34%      |
| 39  | Pipe 186 | ER-186 | 1.83           | 0.00        | 2633.56        | 99.40%      |
| 40  | Pipe 129 | ER-129 | 1.75           | 0.00        | 2635.31        | 99.47%      |
| 41  | Pipe 115 | ER-115 | 1.18           | 0.00        | 2636.50        | 99.52%      |
| 42  | Pipe 295 | ER-295 | 1.13           | 0.00        | 2637.63        | 99.56%      |
| 43  | Pipe 109 | ER-109 | 1.12           | 0.00        | 2638.74        | 99.60%      |
| 44  | Pipe 180 | ER-180 | 0.94           | 0.00        | 2639.68        | 99.64%      |
| 45  | Pipe 114 | ER-114 | 0.87           | 0.00        | 2640.56        | 99.67%      |
| 46  | Pipe 251 | ER-251 | 0.84           | 0.00        | 2641.40        | 99.70%      |
| 47  | Pipe 241 | ER-241 | 0.82           | 0.00        | 2642.22        | 99.73%      |
| 48  | Pipe 277 | ER-277 | 0.80           | 0.00        | 2643.02        | 99.76%      |
| 49  | Pipe 213 | ER-213 | 0.77           | 0.00        | 2643.79        | 99.79%      |
| 50  | Pipe 293 | ER-293 | 0.76           | 0.00        | 2644.54        | 99.82%      |
| 51  | Pipe 20  | ER-20  | 0.69           | 0.00        | 2645.23        | 99.85%      |
| 52  | Pipe 271 | ER-271 | 0.68           | 0.00        | 2645.91        | 99.87%      |
| 53  | Pipe 207 | ER-207 | 0.44           | 0.00        | 2646.35        | 99.89%      |
| 54  | Pipe 239 | ER-239 | 0.44           | 0.00        | 2646.79        | 99.90%      |
| 55  | Pipe 283 | ER-283 | 0.42           | 0.00        | 2647.21        | 99.92%      |
| 56  | Pipe 131 | ER-131 | 0.35           | 0.00        | 2647.56        | 99.93%      |
| 57  | Pipe 317 | ER-317 | 0.28           | 0.00        | 2647.84        | 99.94%      |
| 58  | Pipe 281 | ER-281 | 0.27           | 0.00        | 2648.11        | 99.95%      |
| 59  | Pipe 225 | ER-225 | 0.27           | 0.00        | 2648.38        | 99.96%      |
| 60  | Pipe 319 | ER-319 | 0.26           | 0.00        | 2648.64        | 99.97%      |
| 61  | Pipe 217 | ER-217 | 0.23           | 0.00        | 2648.87        | 99.98%      |
| 62  | Pipe 269 | ER-269 | 0.13           | 0.00        | 2649.00        | 99.99%      |
| 63  | Pipe 181 | ER-181 | 0.09           | 0.00        | 2649.10        | 99.99%      |
| 64  | Pipe 275 | ER-275 | 0.09           | 0.00        | 2649.19        | 99.99%      |
| 65  | Pipe 285 | ER-285 | 0.09           | 0.00        | 2649.28        | 100.00%     |
| 66  | Pipe 116 | ER-116 | 0.06           | 0.00        | 2649.33        | 100.00%     |
|     |          |        | <b>2649.33</b> | <b>100%</b> |                |             |

## CTown network

| No. | ID Link    | ID ER   | ER (kW·h) | % ER  | Accum. ER (kW) | % Accum. ER |
|-----|------------|---------|-----------|-------|----------------|-------------|
| 1   | Pipe P16   | ER-16   | 78.36     | 6.02% | 78.36          | 6.02%       |
| 2   | Pipe P794  | ER-794  | 15.85     | 5.19% | 145.93         | 11.20%      |
| 3   | Pipe P125  | ER-125  | 0.75      | 3.97% | 197.63         | 15.17%      |
| 4   | Pipe P142  | ER-142  | 4.31      | 3.87% | 247.99         | 19.04%      |
| 5   | Pipe P781  | ER-781  | 2.78      | 3.81% | 297.56         | 22.84%      |
| 6   | Pipe P758  | ER-758  | 0.48      | 3.57% | 344.05         | 26.41%      |
| 7   | Pipe P935  | ER-935  | 0.20      | 3.29% | 386.88         | 29.70%      |
| 8   | Pipe P5    | ER-5    | 36.68     | 2.90% | 424.67         | 32.60%      |
| 9   | Pipe P1031 | ER-1031 | 9.58      | 2.82% | 461.35         | 35.42%      |
| 10  | Pipe P983  | ER-983  | 1.88      | 2.60% | 495.18         | 38.01%      |
| 11  | Pipe P282  | ER-282  | 7.69      | 1.97% | 520.87         | 39.99%      |
| 12  | Pipe P924  | ER-924  | 4.90      | 1.89% | 545.55         | 41.88%      |
| 13  | Pipe P329  | ER-329  | 16.78     | 1.79% | 568.90         | 43.67%      |
| 14  | Pipe P811  | ER-811  | 1.71      | 1.78% | 592.04         | 45.45%      |
| 15  | Pipe P409  | ER-409  | 16.11     | 1.77% | 615.10         | 47.22%      |
| 16  | Pipe P1    | ER-1    | 10.57     | 1.74% | 637.75         | 48.96%      |
| 17  | Pipe P120  | ER-120  | 1.60      | 1.69% | 659.73         | 50.65%      |
| 18  | Pipe P949  | ER-949  | 0.01      | 1.51% | 679.45         | 52.16%      |
| 19  | Pipe P12   | ER-12   | 0.35      | 1.42% | 697.98         | 53.58%      |
| 20  | Pipe P768  | ER-768  | 0.21      | 1.40% | 716.21         | 54.98%      |
| 21  | Pipe P344  | ER-344  | 18.53     | 1.39% | 734.29         | 56.37%      |
| 22  | Pipe P1039 | ER-1039 | 21.99     | 1.29% | 751.07         | 57.66%      |
| 23  | Pipe P1041 | ER-1041 | 8.66      | 1.24% | 767.18         | 58.90%      |
| 24  | Pipe P10   | ER-10   | 0.42      | 1.22% | 783.04         | 60.11%      |
| 25  | Pipe P163  | ER-163  | 51.70     | 1.15% | 798.02         | 61.26%      |
| 26  | Pipe P988  | ER-988  | 5.85      | 1.12% | 812.63         | 62.38%      |
| 27  | Pipe P831  | ER-831  | 3.87      | 1.09% | 826.84         | 63.47%      |
| 28  | Pipe P136  | ER-136  | 0.25      | 1.08% | 840.90         | 64.55%      |
| 29  | Pipe P797  | ER-797  | 0.34      | 1.01% | 854.04         | 65.56%      |
| 30  | Pipe P633  | ER-633  | 3.58      | 0.98% | 866.80         | 66.54%      |
| 31  | Pipe P288  | ER-288  | 0.32      | 0.96% | 879.34         | 67.51%      |
| 32  | Pipe P501  | ER-501  | 14.06     | 0.88% | 890.85         | 68.39%      |
| 33  | Pipe P982  | ER-982  | 8.27      | 0.86% | 902.07         | 69.25%      |
| 34  | Pipe P220  | ER-220  | 4.83      | 0.85% | 913.09         | 70.10%      |
| 35  | Pipe P347  | ER-347  | 50.36     | 0.84% | 924.01         | 70.93%      |
| 36  | Pipe P157  | ER-157  | 0.81      | 0.81% | 934.63         | 71.75%      |
| 37  | Pipe P1042 | ER-1042 | 0.79      | 0.81% | 945.20         | 72.56%      |
| 38  | Pipe P424  | ER-424  | 0.15      | 0.81% | 955.75         | 73.37%      |
| 39  | Pipe P947  | ER-947  | 10.61     | 0.81% | 966.30         | 74.18%      |
| 40  | Pipe P218  | ER-218  | 78.36     | 0.78% | 976.45         | 74.96%      |
| 41  | Pipe P981  | ER-981  | 14.98     | 0.76% | 986.33         | 75.72%      |
| 42  | Pipe P1033 | ER-1033 | 3.70      | 0.74% | 995.92         | 76.45%      |
| 43  | Pipe P121  | ER-121  | 1.26      | 0.66% | 1004.57        | 77.12%      |
| 44  | Pipe P8    | ER-8    | 1.27      | 0.66% | 1013.17        | 77.78%      |
| 45  | Pipe P140  | ER-140  | 1.93      | 0.63% | 1021.44        | 78.41%      |
| 46  | Pipe P90   | ER-90   | 6.89      | 0.60% | 1029.22        | 79.01%      |
| 47  | Pipe P1035 | ER-1035 | 10.14     | 0.59% | 1036.91        | 79.60%      |
| 48  | Pipe P822  | ER-822  | 2.52      | 0.59% | 1044.53        | 80.19%      |
| 49  | Pipe P529  | ER-529  | 11.02     | 0.58% | 1052.05        | 80.76%      |
| 50  | Pipe P84   | ER-84   | 4.90      | 0.57% | 1059.50        | 81.34%      |
| 51  | Pipe P309  | ER-309  | 0.38      | 0.54% | 1066.59        | 81.88%      |
| 52  | Pipe P954  | ER-954  | 0.01      | 0.54% | 1073.59        | 82.42%      |

| No. | ID Link    | ID ER   | ER (kW·h) | % ER  | Accum. ER (kW) | % Accum. ER |
|-----|------------|---------|-----------|-------|----------------|-------------|
| 53  | Pipe P211  | ER-211  | 1.07      | 0.53% | 1080.48        | 82.95%      |
| 54  | Pipe P275  | ER-275  | 0.01      | 0.51% | 1087.17        | 83.46%      |
| 55  | Pipe P958  | ER-958  | 0.97      | 0.50% | 1093.70        | 83.96%      |
| 56  | Pipe P28   | ER-28   | 2.78      | 0.49% | 1100.04        | 84.45%      |
| 57  | Pipe P771  | ER-771  | 2.28      | 0.47% | 1106.21        | 84.92%      |
| 58  | Pipe P55   | ER-55   | 1.03      | 0.45% | 1112.09        | 85.37%      |
| 59  | Pipe P127  | ER-127  | 0.25      | 0.45% | 1117.94        | 85.82%      |
| 60  | Pipe P85   | ER-85   | 6.69      | 0.45% | 1123.75        | 86.27%      |
| 61  | Pipe P29   | ER-29   | 6.34      | 0.44% | 1129.49        | 86.71%      |
| 62  | Pipe P779  | ER-779  | 25.68     | 0.43% | 1135.14        | 87.14%      |
| 63  | Pipe P350  | ER-350  | 2.20      | 0.42% | 1140.57        | 87.56%      |
| 64  | Pipe P1036 | ER-1036 | 2.98      | 0.38% | 1145.47        | 87.94%      |
| 65  | Pipe P223  | ER-223  | 12.54     | 0.38% | 1150.37        | 88.31%      |
| 66  | Pipe P141  | ER-141  | 5.73      | 0.37% | 1155.20        | 88.68%      |
| 67  | Pipe P305  | ER-305  | 0.97      | 0.36% | 1159.88        | 89.04%      |
| 68  | Pipe P48   | ER-48   | 4.68      | 0.36% | 1164.53        | 89.40%      |
| 69  | Pipe P725  | ER-725  | 7.09      | 0.35% | 1169.15        | 89.75%      |
| 70  | Pipe P1023 | ER-1023 | 23.35     | 0.33% | 1173.46        | 90.08%      |
| 71  | Pipe P784  | ER-784  | 2.23      | 0.33% | 1177.73        | 90.41%      |
| 72  | Pipe P915  | ER-915  | 1.71      | 0.33% | 1181.98        | 90.74%      |
| 73  | Pipe P128  | ER-128  | 1.28      | 0.30% | 1185.85        | 91.04%      |
| 74  | Pipe P775  | ER-775  | 0.28      | 0.29% | 1189.68        | 91.33%      |
| 75  | Pipe P174  | ER-174  | 18.08     | 0.28% | 1193.38        | 91.61%      |
| 76  | Pipe P131  | ER-131  | 0.33      | 0.27% | 1196.95        | 91.89%      |
| 77  | Pipe P752  | ER-752  | 10.92     | 0.27% | 1200.46        | 92.16%      |
| 78  | Pipe P68   | ER-68   | 0.02      | 0.25% | 1203.67        | 92.40%      |
| 79  | Pipe P286  | ER-286  | 0.01      | 0.23% | 1206.66        | 92.63%      |
| 80  | Pipe P813  | ER-813  | 0.05      | 0.21% | 1209.45        | 92.85%      |
| 81  | Pipe P1024 | ER-1024 | 5.43      | 0.21% | 1212.24        | 93.06%      |
| 82  | Pipe P264  | ER-264  | 1.04      | 0.21% | 1215.01        | 93.27%      |
| 83  | Pipe P51   | ER-51   | 0.04      | 0.20% | 1217.56        | 93.47%      |
| 84  | Pipe P942  | ER-942  | 0.04      | 0.19% | 1220.09        | 93.66%      |
| 85  | Pipe P219  | ER-219  | 1.88      | 0.19% | 1222.61        | 93.86%      |
| 86  | Pipe P58   | ER-58   | 0.43      | 0.18% | 1224.98        | 94.04%      |
| 87  | Pipe P927  | ER-927  | 23.06     | 0.18% | 1227.32        | 94.22%      |
| 88  | Pipe P266  | ER-266  | 10.55     | 0.18% | 1229.60        | 94.39%      |
| 89  | Pipe P809  | ER-809  | 0.71      | 0.17% | 1231.87        | 94.57%      |
| 90  | Pipe P330  | ER-330  | 0.18      | 0.17% | 1234.10        | 94.74%      |
| 91  | Pipe P284  | ER-284  | 4.65      | 0.17% | 1236.31        | 94.91%      |
| 92  | Pipe P766  | ER-766  | 0.37      | 0.16% | 1238.42        | 95.07%      |
| 93  | Pipe P987  | ER-987  | 37.79     | 0.15% | 1240.41        | 95.22%      |
| 94  | Pipe P54   | ER-54   | 0.16      | 0.15% | 1242.40        | 95.38%      |
| 95  | Pipe P827  | ER-827  | 11.51     | 0.15% | 1244.37        | 95.53%      |
| 96  | Pipe P201  | ER-201  | 0.53      | 0.15% | 1246.30        | 95.68%      |
| 97  | Pipe P1034 | ER-1034 | 2.55      | 0.14% | 1248.19        | 95.82%      |
| 98  | Pipe P386  | ER-386  | 0.17      | 0.14% | 1250.06        | 95.96%      |
| 99  | Pipe P946  | ER-946  | 1.67      | 0.14% | 1251.86        | 96.10%      |
| 100 | Pipe P331  | ER-331  | 0.20      | 0.13% | 1253.57        | 96.23%      |
| 101 | Pipe P104  | ER-104  | 7.51      | 0.13% | 1255.28        | 96.37%      |
| 102 | Pipe P807  | ER-807  | 1.99      | 0.13% | 1256.96        | 96.49%      |
| 103 | Pipe P52   | ER-52   | 5.88      | 0.13% | 1258.63        | 96.62%      |
| 104 | Pipe P1044 | ER-1044 | 2.37      | 0.12% | 1260.23        | 96.75%      |
| 105 | Pipe P597  | ER-597  | 0.11      | 0.11% | 1261.61        | 96.85%      |
| 106 | Pipe P978  | ER-978  | 1.38      | 0.11% | 1262.99        | 96.96%      |
| 107 | Pipe P930  | ER-930  | 0.45      | 0.10% | 1264.33        | 97.06%      |
| 108 | Pipe P859  | ER-859  | 12.77     | 0.10% | 1265.67        | 97.16%      |

| No. | ID Link    | ID ER   | ER (kW·h) | % ER  | Accum. ER (kW) | % Accum. ER |
|-----|------------|---------|-----------|-------|----------------|-------------|
| 109 | Pipe P336  | ER-336  | 0.80      | 0.10% | 1266.95        | 97.26%      |
| 110 | Pipe P184  | ER-184  | 3.22      | 0.10% | 1268.22        | 97.36%      |
| 111 | Pipe P177  | ER-177  | 0.07      | 0.10% | 1269.48        | 97.46%      |
| 112 | Pipe P810  | ER-810  | 0.60      | 0.10% | 1270.72        | 97.55%      |
| 113 | Pipe P914  | ER-914  | 4.62      | 0.09% | 1271.89        | 97.64%      |
| 114 | Pipe P940  | ER-940  | 3.50      | 0.09% | 1273.00        | 97.73%      |
| 115 | Pipe P852  | ER-852  | 0.80      | 0.09% | 1274.11        | 97.81%      |
| 116 | Pipe P977  | ER-977  | 0.20      | 0.08% | 1275.19        | 97.89%      |
| 117 | Pipe P241  | ER-241  | 46.48     | 0.08% | 1276.26        | 97.98%      |
| 118 | Pipe P37   | ER-37   | 0.60      | 0.08% | 1277.30        | 98.06%      |
| 119 | Pipe P267  | ER-267  | 0.47      | 0.08% | 1278.34        | 98.14%      |
| 120 | Pipe P880  | ER-880  | 0.02      | 0.08% | 1279.33        | 98.21%      |
| 121 | Pipe P259  | ER-259  | 2.12      | 0.07% | 1280.30        | 98.29%      |
| 122 | Pipe P304  | ER-304  | 18.23     | 0.07% | 1281.26        | 98.36%      |
| 123 | Pipe P144  | ER-144  | 6.17      | 0.06% | 1282.07        | 98.42%      |
| 124 | Pipe P670  | ER-670  | 3.82      | 0.06% | 1282.87        | 98.48%      |
| 125 | Pipe P753  | ER-753  | 0.31      | 0.06% | 1283.66        | 98.54%      |
| 126 | Pipe P147  | ER-147  | 5.65      | 0.06% | 1284.46        | 98.61%      |
| 127 | Pipe P1022 | ER-1022 | 49.57     | 0.06% | 1285.21        | 98.66%      |
| 128 | Pipe P43   | ER-43   | 4.27      | 0.05% | 1285.92        | 98.72%      |
| 129 | Pipe P889  | ER-889  | 67.57     | 0.05% | 1286.53        | 98.76%      |
| 130 | Pipe P71   | ER-71   | 13.14     | 0.05% | 1287.14        | 98.81%      |
| 131 | Pipe P759  | ER-759  | 8.59      | 0.05% | 1287.73        | 98.86%      |
| 132 | Pipe P830  | ER-830  | 0.15      | 0.05% | 1288.32        | 98.90%      |
| 133 | Pipe P855  | ER-855  | 1.68      | 0.04% | 1288.88        | 98.94%      |
| 134 | Pipe P866  | ER-866  | 2.28      | 0.04% | 1289.42        | 98.99%      |
| 135 | Pipe P502  | ER-502  | 1.24      | 0.04% | 1289.94        | 99.03%      |
| 136 | Pipe P962  | ER-962  | 23.14     | 0.04% | 1290.45        | 99.07%      |
| 137 | Pipe P1027 | ER-1027 | 2.80      | 0.04% | 1290.93        | 99.10%      |
| 138 | Pipe P760  | ER-760  | 0.33      | 0.04% | 1291.40        | 99.14%      |
| 139 | Pipe P609  | ER-609  | 7.62      | 0.03% | 1291.86        | 99.17%      |
| 140 | Pipe P858  | ER-858  | 1.97      | 0.03% | 1292.29        | 99.21%      |
| 141 | Pipe P39   | ER-39   | 0.59      | 0.03% | 1292.73        | 99.24%      |
| 142 | Pipe P124  | ER-124  | 14.21     | 0.03% | 1293.15        | 99.27%      |
| 143 | Pipe P861  | ER-861  | 7.45      | 0.03% | 1293.53        | 99.30%      |
| 144 | Pipe P91   | ER-91   | 0.24      | 0.03% | 1293.91        | 99.33%      |
| 145 | Pipe P228  | ER-228  | 0.27      | 0.03% | 1294.29        | 99.36%      |
| 146 | Pipe P492  | ER-492  | 0.08      | 0.03% | 1294.67        | 99.39%      |
| 147 | Pipe P11   | ER-11   | 0.12      | 0.03% | 1295.02        | 99.42%      |
| 148 | Pipe P130  | ER-130  | 5.81      | 0.03% | 1295.36        | 99.44%      |
| 149 | Pipe P346  | ER-346  | 1.11      | 0.03% | 1295.69        | 99.47%      |
| 150 | Pipe P821  | ER-821  | 0.03      | 0.03% | 1296.02        | 99.49%      |
| 151 | Pipe P968  | ER-968  | 0.55      | 0.03% | 1296.36        | 99.52%      |
| 152 | Pipe P132  | ER-132  | 0.44      | 0.02% | 1296.68        | 99.54%      |
| 153 | Pipe P959  | ER-959  | 1.34      | 0.02% | 1297.00        | 99.57%      |
| 154 | Pipe P871  | ER-871  | 0.39      | 0.02% | 1297.31        | 99.59%      |
| 155 | Pipe P956  | ER-956  | 0.54      | 0.02% | 1297.63        | 99.62%      |
| 156 | Pipe P776  | ER-776  | 0.32      | 0.02% | 1297.94        | 99.64%      |
| 157 | Pipe P337  | ER-337  | 0.99      | 0.02% | 1298.22        | 99.66%      |
| 158 | Pipe P986  | ER-986  | 0.62      | 0.02% | 1298.50        | 99.68%      |
| 159 | Pipe P842  | ER-842  | 7.78      | 0.02% | 1298.76        | 99.70%      |
| 160 | Pipe P272  | ER-272  | 0.38      | 0.02% | 1299.02        | 99.72%      |
| 161 | Pipe P129  | ER-129  | 1.17      | 0.02% | 1299.27        | 99.74%      |
| 162 | Pipe P941  | ER-941  | 4.25      | 0.02% | 1299.51        | 99.76%      |
| 163 | Pipe P841  | ER-841  | 24.68     | 0.02% | 1299.76        | 99.78%      |
| 164 | Pipe P976  | ER-976  | 2.34      | 0.02% | 1300.00        | 99.80%      |

| No. | ID Link    | ID ER   | ER (kW·h)      | % ER        | Accum. ER (kW) | % Accum. ER |
|-----|------------|---------|----------------|-------------|----------------|-------------|
| 165 | Pipe P957  | ER-957  | 1.34           | 0.02%       | 1300.23        | 99.82%      |
| 166 | Pipe P119  | ER-119  | 42.83          | 0.02%       | 1300.44        | 99.83%      |
| 167 | Pipe P754  | ER-754  | 1.11           | 0.02%       | 1300.64        | 99.85%      |
| 168 | Pipe P1028 | ER-1028 | 0.25           | 0.02%       | 1300.84        | 99.86%      |
| 169 | Pipe P527  | ER-527  | 2.53           | 0.01%       | 1301.03        | 99.88%      |
| 170 | Pipe P46   | ER-46   | 1.79           | 0.01%       | 1301.21        | 99.89%      |
| 171 | Pipe P510  | ER-510  | 10.55          | 0.01%       | 1301.38        | 99.90%      |
| 172 | Pipe P955  | ER-955  | 19.72          | 0.01%       | 1301.55        | 99.92%      |
| 173 | Pipe P500  | ER-500  | 6.99           | 0.01%       | 1301.71        | 99.93%      |
| 174 | Pipe P801  | ER-801  | 0.16           | 0.01%       | 1301.86        | 99.94%      |
| 175 | Pipe P156  | ER-156  | 0.31           | 0.01%       | 1302.00        | 99.95%      |
| 176 | Pipe P847  | ER-847  | 0.23           | 0.01%       | 1302.12        | 99.96%      |
| 177 | Pipe P596  | ER-596  | 6.54           | 0.01%       | 1302.24        | 99.97%      |
| 178 | Pipe P846  | ER-846  | 0.32           | 0.01%       | 1302.32        | 99.98%      |
| 179 | Pipe P7    | ER-7    | 0.50           | 0.01%       | 1302.39        | 99.98%      |
| 180 | Pipe P35   | ER-35   | 0.33           | 0.00%       | 1302.44        | 99.99%      |
| 181 | Pipe P372  | ER-372  | 0.24           | 0.00%       | 1302.48        | 99.99%      |
| 182 | Pipe P38   | ER-38   | 1.08           | 0.00%       | 1302.51        | 99.99%      |
| 183 | Pipe P853  | ER-853  | 1.37           | 0.00%       | 1302.55        | 99.99%      |
| 184 | Pipe P761  | ER-761  | 9.89           | 0.00%       | 1302.56        | 100.00%     |
| 185 | Pipe P348  | ER-348  | 11.22          | 0.00%       | 1302.58        | 100.00%     |
| 186 | Pipe P349  | ER-349  | 33.83          | 0.00%       | 1302.59        | 100.00%     |
| 187 | Pipe P243  | ER-243  | 0.01           | 0.00%       | 1302.60        | 100.00%     |
| 188 | Pipe P231  | ER-231  | 0.27           | 0.00%       | 1302.61        | 100.00%     |
| 189 | Pipe P984  | ER-984  | 1.99           | 0.00%       | 1302.62        | 100.00%     |
| 190 | Pipe P1045 | ER-1045 | 14.61          | 0.00%       | 1302.62        | 100.00%     |
|     |            |         | <b>1358.34</b> | <b>100%</b> |                |             |

#### Balerna network

| No. | ID Link  | ID ER  | ER (kW·h) | % ER  | Accum. ER (kW) | % Accum. ER |
|-----|----------|--------|-----------|-------|----------------|-------------|
| 1   | Pipe 365 | ER-365 | 7.32      | 8.25% | 7.32           | 8.25%       |
| 2   | Pipe 576 | ER-576 | 3.59      | 4.04% | 10.91          | 12.29%      |
| 3   | Pipe 151 | ER-151 | 3.19      | 3.59% | 14.10          | 15.87%      |
| 4   | Pipe 174 | ER-174 | 3.15      | 3.55% | 17.25          | 19.42%      |
| 5   | Pipe 157 | ER-157 | 3.09      | 3.48% | 20.34          | 22.91%      |
| 6   | Pipe 107 | ER-107 | 2.53      | 2.84% | 22.87          | 25.75%      |
| 7   | Pipe 171 | ER-171 | 2.14      | 2.41% | 25.01          | 28.16%      |
| 8   | Pipe 249 | ER-249 | 2.13      | 2.40% | 27.14          | 30.56%      |
| 9   | Pipe 221 | ER-221 | 2.07      | 2.33% | 29.21          | 32.89%      |
| 10  | Pipe 146 | ER-146 | 2.02      | 2.28% | 31.23          | 35.16%      |
| 11  | Pipe 219 | ER-219 | 2.00      | 2.25% | 33.23          | 37.41%      |
| 12  | Pipe 545 | ER-545 | 1.81      | 2.04% | 35.04          | 39.45%      |
| 13  | Pipe 333 | ER-333 | 1.81      | 2.04% | 36.85          | 41.49%      |
| 14  | Pipe 142 | ER-142 | 1.67      | 1.88% | 38.52          | 43.37%      |
| 15  | Pipe 44  | ER-44  | 1.51      | 1.70% | 40.03          | 45.07%      |
| 16  | Pipe 56  | ER-56  | 1.40      | 1.57% | 41.43          | 46.64%      |
| 17  | Pipe 3   | ER-3   | 1.34      | 1.51% | 42.77          | 48.16%      |
| 18  | Pipe 132 | ER-132 | 1.20      | 1.35% | 43.97          | 49.51%      |
| 19  | Pipe 480 | ER-480 | 1.11      | 1.25% | 45.08          | 50.76%      |
| 20  | Pipe 175 | ER-175 | 1.11      | 1.25% | 46.19          | 52.01%      |
| 21  | Pipe 222 | ER-222 | 1.04      | 1.17% | 47.23          | 53.17%      |
| 22  | Pipe 59  | ER-59  | 0.84      | 0.95% | 48.07          | 54.12%      |
| 23  | Pipe 136 | ER-136 | 0.84      | 0.95% | 48.91          | 55.07%      |

| No. | ID Link  | ID ER  | ER (kW·h) | % ER  | Accum. ER (kW) | % Accum. ER |
|-----|----------|--------|-----------|-------|----------------|-------------|
| 24  | Pipe 140 | ER-140 | 0.81      | 0.91% | 49.72          | 55.98%      |
| 25  | Pipe 245 | ER-245 | 0.78      | 0.88% | 50.50          | 56.86%      |
| 26  | Pipe 500 | ER-500 | 0.78      | 0.87% | 51.28          | 57.73%      |
| 27  | Pipe 542 | ER-542 | 0.76      | 0.86% | 52.04          | 58.59%      |
| 28  | Pipe 258 | ER-258 | 0.73      | 0.83% | 52.77          | 59.41%      |
| 29  | Pipe 208 | ER-208 | 0.69      | 0.78% | 53.46          | 60.19%      |
| 30  | Pipe 118 | ER-118 | 0.69      | 0.78% | 54.15          | 60.97%      |
| 31  | Pipe 390 | ER-390 | 0.67      | 0.75% | 54.82          | 61.72%      |
| 32  | Pipe 209 | ER-209 | 0.64      | 0.73% | 55.46          | 62.45%      |
| 33  | Pipe 383 | ER-383 | 0.64      | 0.72% | 56.11          | 63.17%      |
| 34  | Pipe 257 | ER-257 | 0.63      | 0.71% | 56.74          | 63.88%      |
| 35  | Pipe 110 | ER-110 | 0.61      | 0.69% | 57.35          | 64.57%      |
| 36  | Pipe 306 | ER-306 | 0.61      | 0.69% | 57.96          | 65.26%      |
| 37  | Pipe 53  | ER-53  | 0.61      | 0.69% | 58.57          | 65.95%      |
| 38  | Pipe 571 | ER-571 | 0.60      | 0.68% | 59.17          | 66.62%      |
| 39  | Pipe 15  | ER-15  | 0.59      | 0.67% | 59.77          | 67.29%      |
| 40  | Pipe 497 | ER-497 | 0.53      | 0.60% | 60.30          | 67.89%      |
| 41  | Pipe 40  | ER-40  | 0.52      | 0.59% | 60.82          | 68.48%      |
| 42  | Pipe 65  | ER-65  | 0.51      | 0.57% | 61.33          | 69.05%      |
| 43  | Pipe 299 | ER-299 | 0.48      | 0.54% | 61.81          | 69.59%      |
| 44  | Pipe 47  | ER-47  | 0.48      | 0.54% | 62.28          | 70.12%      |
| 45  | Pipe 179 | ER-179 | 0.45      | 0.51% | 62.73          | 70.63%      |
| 46  | Pipe 321 | ER-321 | 0.45      | 0.51% | 63.18          | 71.14%      |
| 47  | Pipe 554 | ER-554 | 0.45      | 0.50% | 63.63          | 71.64%      |
| 48  | Pipe 46  | ER-46  | 0.44      | 0.50% | 64.07          | 72.14%      |
| 49  | Pipe 119 | ER-119 | 0.44      | 0.50% | 64.51          | 72.63%      |
| 50  | Pipe 332 | ER-332 | 0.44      | 0.49% | 64.95          | 73.13%      |
| 51  | Pipe 42  | ER-42  | 0.43      | 0.49% | 65.39          | 73.62%      |
| 52  | Pipe 147 | ER-147 | 0.42      | 0.48% | 65.81          | 74.09%      |
| 53  | Pipe 114 | ER-114 | 0.40      | 0.45% | 66.21          | 74.55%      |
| 54  | Pipe 41  | ER-41  | 0.40      | 0.45% | 66.61          | 75.00%      |
| 55  | Pipe 523 | ER-523 | 0.40      | 0.45% | 67.01          | 75.45%      |
| 56  | Pipe 601 | ER-601 | 0.40      | 0.45% | 67.41          | 75.90%      |
| 57  | Pipe 373 | ER-373 | 0.39      | 0.44% | 67.80          | 76.33%      |
| 58  | Pipe 289 | ER-289 | 0.38      | 0.43% | 68.18          | 76.76%      |
| 59  | Pipe 38  | ER-38  | 0.38      | 0.43% | 68.56          | 77.19%      |
| 60  | Pipe 133 | ER-133 | 0.38      | 0.43% | 68.94          | 77.62%      |
| 61  | Pipe 141 | ER-141 | 0.38      | 0.42% | 69.32          | 78.05%      |
| 62  | Pipe 616 | ER-616 | 0.37      | 0.42% | 69.69          | 78.46%      |
| 63  | Pipe 349 | ER-349 | 0.36      | 0.40% | 70.05          | 78.86%      |
| 64  | Pipe 290 | ER-290 | 0.36      | 0.40% | 70.40          | 79.26%      |
| 65  | Pipe 77  | ER-77  | 0.35      | 0.39% | 70.75          | 79.66%      |
| 66  | Pipe 473 | ER-473 | 0.34      | 0.39% | 71.09          | 80.04%      |
| 67  | Pipe 259 | ER-259 | 0.34      | 0.38% | 71.43          | 80.42%      |
| 68  | Pipe 244 | ER-244 | 0.34      | 0.38% | 71.77          | 80.80%      |
| 69  | Pipe 5   | ER-5   | 0.33      | 0.37% | 72.10          | 81.17%      |
| 70  | Pipe 369 | ER-369 | 0.33      | 0.37% | 72.43          | 81.54%      |
| 71  | Pipe 352 | ER-352 | 0.30      | 0.34% | 72.73          | 81.88%      |
| 72  | Pipe 262 | ER-262 | 0.29      | 0.33% | 73.02          | 82.21%      |
| 73  | Pipe 354 | ER-354 | 0.29      | 0.33% | 73.31          | 82.54%      |
| 74  | Pipe 282 | ER-282 | 0.28      | 0.32% | 73.59          | 82.86%      |
| 75  | Pipe 143 | ER-143 | 0.28      | 0.32% | 73.87          | 83.17%      |
| 76  | Pipe 260 | ER-260 | 0.28      | 0.31% | 74.15          | 83.48%      |
| 77  | Pipe 398 | ER-398 | 0.28      | 0.31% | 74.42          | 83.79%      |
| 78  | Pipe 351 | ER-351 | 0.27      | 0.31% | 74.70          | 84.10%      |
| 79  | Pipe 166 | ER-166 | 0.27      | 0.31% | 74.97          | 84.41%      |

| No. | ID Link  | ID ER  | ER (kW·h) | % ER  | Accum. ER (kW) | % Accum. ER |
|-----|----------|--------|-----------|-------|----------------|-------------|
| 80  | Pipe 312 | ER-312 | 0.27      | 0.31% | 75.25          | 84.72%      |
| 81  | Pipe 121 | ER-121 | 0.27      | 0.31% | 75.52          | 85.03%      |
| 82  | Pipe 325 | ER-325 | 0.27      | 0.30% | 75.79          | 85.33%      |
| 83  | Pipe 620 | ER-620 | 0.26      | 0.29% | 76.05          | 85.62%      |
| 84  | Pipe 220 | ER-220 | 0.26      | 0.29% | 76.30          | 85.91%      |
| 85  | Pipe 331 | ER-331 | 0.25      | 0.28% | 76.56          | 86.19%      |
| 86  | Pipe 137 | ER-137 | 0.25      | 0.28% | 76.81          | 86.48%      |
| 87  | Pipe 87  | ER-87  | 0.25      | 0.28% | 77.06          | 86.76%      |
| 88  | Pipe 318 | ER-318 | 0.24      | 0.27% | 77.30          | 87.03%      |
| 89  | Pipe 240 | ER-240 | 0.24      | 0.27% | 77.54          | 87.31%      |
| 90  | Pipe 548 | ER-548 | 0.24      | 0.27% | 77.79          | 87.58%      |
| 91  | Pipe 357 | ER-357 | 0.24      | 0.27% | 78.03          | 87.85%      |
| 92  | Pipe 58  | ER-58  | 0.24      | 0.27% | 78.26          | 88.12%      |
| 93  | Pipe 404 | ER-404 | 0.23      | 0.26% | 78.50          | 88.38%      |
| 94  | Pipe 12  | ER-12  | 0.23      | 0.26% | 78.73          | 88.64%      |
| 95  | Pipe 546 | ER-546 | 0.22      | 0.25% | 78.95          | 88.89%      |
| 96  | Pipe 52  | ER-52  | 0.22      | 0.24% | 79.17          | 89.13%      |
| 97  | Pipe 226 | ER-226 | 0.21      | 0.24% | 79.38          | 89.37%      |
| 98  | Pipe 206 | ER-206 | 0.20      | 0.22% | 79.58          | 89.59%      |
| 99  | Pipe 229 | ER-229 | 0.19      | 0.22% | 79.77          | 89.81%      |
| 100 | Pipe 294 | ER-294 | 0.19      | 0.21% | 79.96          | 90.02%      |
| 101 | Pipe 567 | ER-567 | 0.19      | 0.21% | 80.14          | 90.23%      |
| 102 | Pipe 324 | ER-324 | 0.19      | 0.21% | 80.33          | 90.44%      |
| 103 | Pipe 113 | ER-113 | 0.18      | 0.20% | 80.51          | 90.65%      |
| 104 | Pipe 345 | ER-345 | 0.18      | 0.20% | 80.69          | 90.85%      |
| 105 | Pipe 275 | ER-275 | 0.17      | 0.20% | 80.86          | 91.04%      |
| 106 | Pipe 288 | ER-288 | 0.17      | 0.19% | 81.03          | 91.23%      |
| 107 | Pipe 154 | ER-154 | 0.17      | 0.19% | 81.20          | 91.42%      |
| 108 | Pipe 446 | ER-446 | 0.16      | 0.18% | 81.37          | 91.61%      |
| 109 | Pipe 501 | ER-501 | 0.16      | 0.18% | 81.53          | 91.79%      |
| 110 | Pipe 106 | ER-106 | 0.16      | 0.18% | 81.69          | 91.97%      |
| 111 | Pipe 338 | ER-338 | 0.16      | 0.18% | 81.85          | 92.15%      |
| 112 | Pipe 547 | ER-547 | 0.16      | 0.18% | 82.00          | 92.32%      |
| 113 | Pipe 517 | ER-517 | 0.15      | 0.17% | 82.16          | 92.50%      |
| 114 | Pipe 323 | ER-323 | 0.15      | 0.17% | 82.31          | 92.67%      |
| 115 | Pipe 414 | ER-414 | 0.15      | 0.17% | 82.46          | 92.84%      |
| 116 | Pipe 530 | ER-530 | 0.15      | 0.17% | 82.61          | 93.01%      |
| 117 | Pipe 298 | ER-298 | 0.15      | 0.16% | 82.75          | 93.17%      |
| 118 | Pipe 238 | ER-238 | 0.15      | 0.16% | 82.90          | 93.34%      |
| 119 | Pipe 112 | ER-112 | 0.14      | 0.16% | 83.04          | 93.50%      |
| 120 | Pipe 515 | ER-515 | 0.14      | 0.16% | 83.18          | 93.65%      |
| 121 | Pipe 496 | ER-496 | 0.14      | 0.16% | 83.32          | 93.81%      |
| 122 | Pipe 188 | ER-188 | 0.13      | 0.15% | 83.45          | 93.96%      |
| 123 | Pipe 152 | ER-152 | 0.13      | 0.15% | 83.59          | 94.11%      |
| 124 | Pipe 247 | ER-247 | 0.13      | 0.15% | 83.72          | 94.26%      |
| 125 | Pipe 144 | ER-144 | 0.13      | 0.15% | 83.85          | 94.40%      |
| 126 | Pipe 409 | ER-409 | 0.13      | 0.15% | 83.98          | 94.55%      |
| 127 | Pipe 164 | ER-164 | 0.13      | 0.14% | 84.11          | 94.69%      |
| 128 | Pipe 104 | ER-104 | 0.13      | 0.14% | 84.23          | 94.84%      |
| 129 | Pipe 126 | ER-126 | 0.12      | 0.14% | 84.35          | 94.97%      |
| 130 | Pipe 350 | ER-350 | 0.12      | 0.14% | 84.47          | 95.11%      |
| 131 | Pipe 78  | ER-78  | 0.12      | 0.13% | 84.59          | 95.24%      |
| 132 | Pipe 131 | ER-131 | 0.12      | 0.13% | 84.71          | 95.37%      |
| 133 | Pipe 120 | ER-120 | 0.12      | 0.13% | 84.83          | 95.50%      |
| 134 | Pipe 32  | ER-32  | 0.12      | 0.13% | 84.94          | 95.64%      |
| 135 | Pipe 589 | ER-589 | 0.11      | 0.13% | 85.06          | 95.76%      |

| No. | ID Link  | ID ER  | ER (kW·h) | % ER  | Accum. ER (kW) | % Accum. ER |
|-----|----------|--------|-----------|-------|----------------|-------------|
| 136 | Pipe 276 | ER-276 | 0.11      | 0.12% | 85.16          | 95.89%      |
| 137 | Pipe 4   | ER-4   | 0.10      | 0.12% | 85.27          | 96.00%      |
| 138 | Pipe 239 | ER-239 | 0.10      | 0.11% | 85.37          | 96.12%      |
| 139 | Pipe 361 | ER-361 | 0.10      | 0.11% | 85.47          | 96.23%      |
| 140 | Pipe 108 | ER-108 | 0.10      | 0.11% | 85.56          | 96.33%      |
| 141 | Pipe 181 | ER-181 | 0.09      | 0.11% | 85.66          | 96.44%      |
| 142 | Pipe 555 | ER-555 | 0.09      | 0.10% | 85.75          | 96.54%      |
| 143 | Pipe 424 | ER-424 | 0.09      | 0.10% | 85.84          | 96.65%      |
| 144 | Pipe 153 | ER-153 | 0.09      | 0.10% | 85.93          | 96.74%      |
| 145 | Pipe 19  | ER-19  | 0.09      | 0.10% | 86.01          | 96.84%      |
| 146 | Pipe 386 | ER-386 | 0.09      | 0.10% | 86.10          | 96.94%      |
| 147 | Pipe 172 | ER-172 | 0.08      | 0.09% | 86.19          | 97.04%      |
| 148 | Pipe 256 | ER-256 | 0.08      | 0.09% | 86.27          | 97.13%      |
| 149 | Pipe 457 | ER-457 | 0.08      | 0.09% | 86.35          | 97.22%      |
| 150 | Pipe 430 | ER-430 | 0.08      | 0.08% | 86.42          | 97.30%      |
| 151 | Pipe 185 | ER-185 | 0.07      | 0.08% | 86.49          | 97.38%      |
| 152 | Pipe 423 | ER-423 | 0.07      | 0.08% | 86.57          | 97.47%      |
| 153 | Pipe 521 | ER-521 | 0.07      | 0.08% | 86.64          | 97.55%      |
| 154 | Pipe 416 | ER-416 | 0.07      | 0.08% | 86.71          | 97.63%      |
| 155 | Pipe 374 | ER-374 | 0.07      | 0.08% | 86.78          | 97.71%      |
| 156 | Pipe 415 | ER-415 | 0.07      | 0.08% | 86.86          | 97.79%      |
| 157 | Pipe 590 | ER-590 | 0.07      | 0.08% | 86.92          | 97.87%      |
| 158 | Pipe 429 | ER-429 | 0.07      | 0.07% | 86.99          | 97.94%      |
| 159 | Pipe 160 | ER-160 | 0.06      | 0.07% | 87.05          | 98.01%      |
| 160 | Pipe 57  | ER-57  | 0.06      | 0.07% | 87.11          | 98.08%      |
| 161 | Pipe 161 | ER-161 | 0.06      | 0.07% | 87.17          | 98.15%      |
| 162 | Pipe 159 | ER-159 | 0.06      | 0.07% | 87.23          | 98.22%      |
| 163 | Pipe 418 | ER-418 | 0.06      | 0.07% | 87.29          | 98.28%      |
| 164 | Pipe 148 | ER-148 | 0.06      | 0.06% | 87.35          | 98.35%      |
| 165 | Pipe 70  | ER-70  | 0.06      | 0.06% | 87.41          | 98.41%      |
| 166 | Pipe 279 | ER-279 | 0.06      | 0.06% | 87.46          | 98.47%      |
| 167 | Pipe 2   | ER-2   | 0.05      | 0.06% | 87.52          | 98.53%      |
| 168 | Pipe 265 | ER-265 | 0.05      | 0.06% | 87.57          | 98.59%      |
| 169 | Pipe 513 | ER-513 | 0.05      | 0.06% | 87.62          | 98.65%      |
| 170 | Pipe 261 | ER-261 | 0.05      | 0.06% | 87.68          | 98.71%      |
| 171 | Pipe 474 | ER-474 | 0.05      | 0.06% | 87.73          | 98.77%      |
| 172 | Pipe 82  | ER-82  | 0.05      | 0.06% | 87.78          | 98.83%      |
| 173 | Pipe 194 | ER-194 | 0.05      | 0.06% | 87.83          | 98.89%      |
| 174 | Pipe 33  | ER-33  | 0.05      | 0.05% | 87.88          | 98.94%      |
| 175 | Pipe 307 | ER-307 | 0.05      | 0.05% | 87.93          | 98.99%      |
| 176 | Pipe 123 | ER-123 | 0.05      | 0.05% | 87.97          | 99.05%      |
| 177 | Pipe 122 | ER-122 | 0.05      | 0.05% | 88.02          | 99.10%      |
| 178 | Pipe 190 | ER-190 | 0.05      | 0.05% | 88.07          | 99.15%      |
| 179 | Pipe 86  | ER-86  | 0.05      | 0.05% | 88.11          | 99.20%      |
| 180 | Pipe 499 | ER-499 | 0.05      | 0.05% | 88.16          | 99.25%      |
| 181 | Pipe 74  | ER-74  | 0.04      | 0.05% | 88.20          | 99.30%      |
| 182 | Pipe 406 | ER-406 | 0.04      | 0.05% | 88.24          | 99.35%      |
| 183 | Pipe 134 | ER-134 | 0.04      | 0.05% | 88.29          | 99.40%      |
| 184 | Pipe 486 | ER-486 | 0.04      | 0.05% | 88.33          | 99.45%      |
| 185 | Pipe 519 | ER-519 | 0.04      | 0.04% | 88.36          | 99.49%      |
| 186 | Pipe 615 | ER-615 | 0.03      | 0.03% | 88.39          | 99.52%      |
| 187 | Pipe 359 | ER-359 | 0.03      | 0.03% | 88.42          | 99.55%      |
| 188 | Pipe 27  | ER-27  | 0.03      | 0.03% | 88.45          | 99.58%      |
| 189 | Pipe 227 | ER-227 | 0.03      | 0.03% | 88.48          | 99.62%      |
| 190 | Pipe 91  | ER-91  | 0.02      | 0.03% | 88.50          | 99.64%      |
| 191 | Pipe 88  | ER-88  | 0.02      | 0.03% | 88.52          | 99.67%      |

| No. | ID Link  | ID ER  | ER (kW·h)    | % ER        | Accum. ER (kW) | % Accum. ER |
|-----|----------|--------|--------------|-------------|----------------|-------------|
| 192 | Pipe 498 | ER-498 | 0.02         | 0.02%       | 88.55          | 99.69%      |
| 193 | Pipe 81  | ER-81  | 0.02         | 0.02%       | 88.57          | 99.72%      |
| 194 | Pipe 23  | ER-23  | 0.02         | 0.02%       | 88.59          | 99.74%      |
| 195 | Pipe 124 | ER-124 | 0.02         | 0.02%       | 88.60          | 99.76%      |
| 196 | Pipe 50  | ER-50  | 0.02         | 0.02%       | 88.62          | 99.78%      |
| 197 | Pipe 246 | ER-246 | 0.02         | 0.02%       | 88.64          | 99.80%      |
| 198 | Pipe 485 | ER-485 | 0.02         | 0.02%       | 88.65          | 99.81%      |
| 199 | Pipe 223 | ER-223 | 0.02         | 0.02%       | 88.67          | 99.83%      |
| 200 | Pipe 368 | ER-368 | 0.02         | 0.02%       | 88.68          | 99.85%      |
| 201 | Pipe 568 | ER-568 | 0.01         | 0.02%       | 88.70          | 99.86%      |
| 202 | Pipe 401 | ER-401 | 0.01         | 0.02%       | 88.71          | 99.88%      |
| 203 | Pipe 459 | ER-459 | 0.01         | 0.01%       | 88.73          | 99.90%      |
| 204 | Pipe 28  | ER-28  | 0.01         | 0.01%       | 88.74          | 99.91%      |
| 205 | Pipe 177 | ER-177 | 0.01         | 0.01%       | 88.75          | 99.92%      |
| 206 | Pipe 329 | ER-329 | 0.01         | 0.01%       | 88.76          | 99.93%      |
| 207 | Pipe 277 | ER-277 | 0.01         | 0.01%       | 88.77          | 99.94%      |
| 208 | Pipe 537 | ER-537 | 0.01         | 0.01%       | 88.78          | 99.95%      |
| 209 | Pipe 607 | ER-607 | 0.01         | 0.01%       | 88.78          | 99.96%      |
| 210 | Pipe 536 | ER-536 | 0.01         | 0.01%       | 88.79          | 99.97%      |
| 211 | Pipe 255 | ER-255 | 0.01         | 0.01%       | 88.80          | 99.98%      |
| 212 | Pipe 385 | ER-385 | 0.01         | 0.01%       | 88.80          | 99.98%      |
| 213 | Pipe 92  | ER-92  | 0.00         | 0.00%       | 88.81          | 99.99%      |
| 214 | Pipe 564 | ER-564 | 0.00         | 0.00%       | 88.81          | 99.99%      |
| 215 | Pipe 526 | ER-526 | 0.00         | 0.00%       | 88.81          | 99.99%      |
| 216 | Pipe 1   | ER-1   | 0.00         | 0.00%       | 88.81          | 99.99%      |
| 217 | Pipe 63  | ER-63  | 0.00         | 0.00%       | 88.81          | 100.00%     |
| 218 | Pipe 450 | ER-450 | 0.00         | 0.00%       | 88.82          | 100.00%     |
| 219 | Pipe 539 | ER-539 | 0.00         | 0.00%       | 88.82          | 100.00%     |
| 220 | Pipe 538 | ER-538 | 0.00         | 0.00%       | 88.82          | 100.00%     |
| 221 | Pipe 525 | ER-525 | 0.00         | 0.00%       | 88.82          | 100.00%     |
| 222 | Pipe 254 | ER-254 | 0.00         | 0.00%       | 88.82          | 100.00%     |
| 223 | Pipe 322 | ER-322 | 0.00         | 0.00%       | 88.82          | 100.00%     |
| 224 | Pipe 405 | ER-405 | 0.00         | 0.00%       | 88.82          | 100.00%     |
| 225 | Pipe 51  | ER-51  | 0.00         | 0.00%       | 88.82          | 100.00%     |
|     |          |        | <b>88.82</b> | <b>100%</b> |                |             |

## References

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