

A SIMPLE ORCHARD DESIGN

Tasks covered in this tutorial:

- Drawing simple background information
- Creating sprayline outlets
- Drawing a block of connected spraylines (laterals)
- Specifying lateral and outlet spacing
- Connecting up multiple zone items
- Saving a design
- Specifying the maximum allowable velocity
- Limiting number of pipe sizes selected by computer sizing

STARTING THE TUTORIAL

1. Double-click on the IRRICAD icon or select *Start|All Programs|IRRICAD|IRRICAD 9 Pro* to start IRRICAD. If IRRICAD is already running select *File|New* to start with a clean design. In *Settings|Irrigation – Design Specific* and [Browse] for the DemoDBS.mdb database. Highlight and select [Open]. Change the “Zone Pipes Line Width” to **2** and the “Mainline Pipe Line Width” to **3**.
2. Go to the **Units** tab and click the [US] ([Metric]) button to restore the default units for this tutorial. Note Metric measurements are displayed in brackets. These settings can be retained for each design by clicking the [Save As Default] button.
3. Select the **Misc** tab and click the “Medium Design Size”. Change the “Base Database Symbol Size” to **10ft (3m)**. This determines the size of the symbols according to the size of the design. When you are finished click [OK].

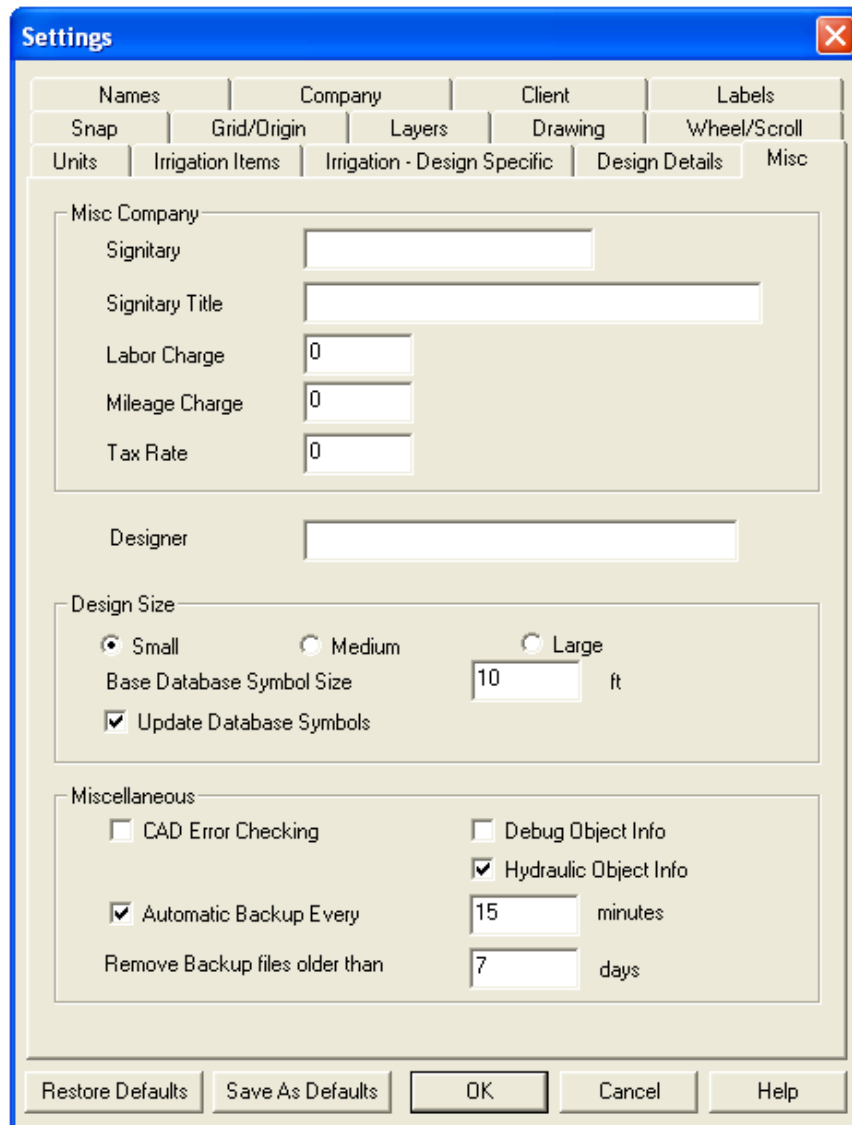



Figure SM 1

ENTER BACKGROUND INFORMATION

4. This is information required to position the irrigation system. Examples include boundaries, roads, buildings, text and symbols. For this tutorial we will put in a **390 x 150ft (120 x 45m)** rectangle for the block boundary.
5. Select *Draw|Rectangle|2 Point* and move the cursor to the bottom left of the screen and click the left mouse button to start the rectangle. You will notice that the status bar will ask you to enter the corner point of the rectangle prior to you clicking the mouse and for you to enter the opposite corner after you have placed the first. Draw the cursor away from the first point and left-click to place the second point. Now select *Tools|Change* (or click on the Chameleon  on the left-hand tool bar) and click on the border of the rectangle. Edit the "Width" to be **390 (120)** and the "Height" to be **150 (45)**. Click **[OK]**. Select *View|Zoom All*.
6. Your design should look like Figure SM 2.

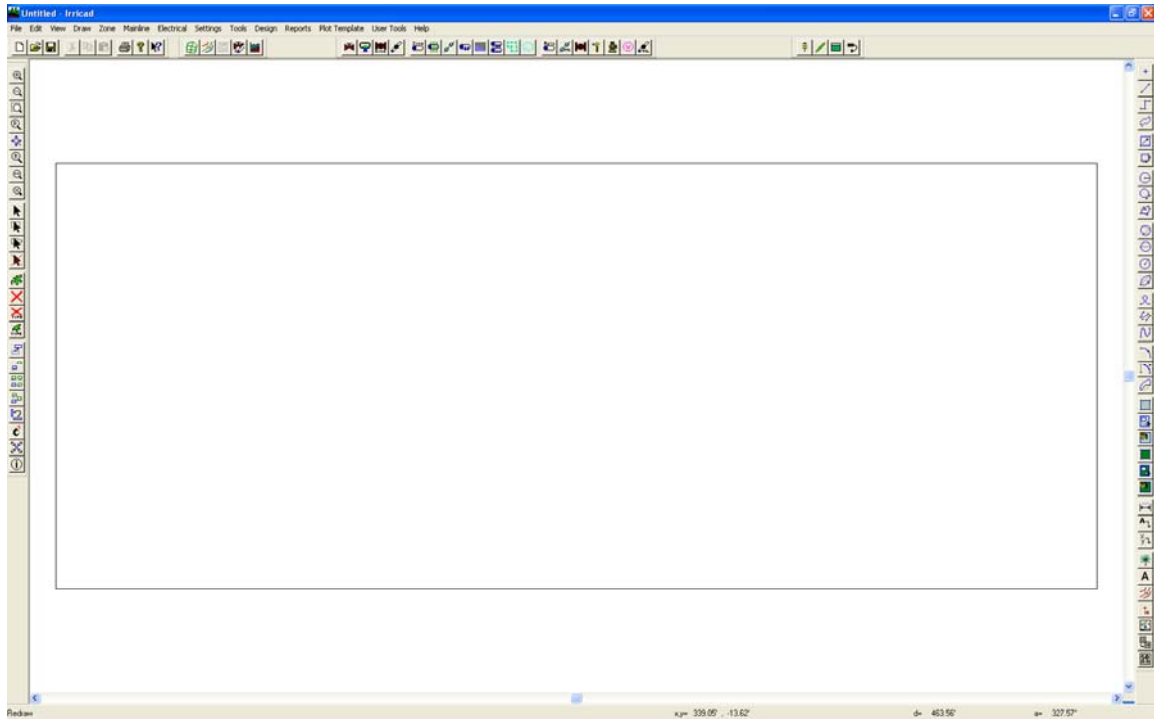



Figure SM 2

PLACING THE BLOCK

7. Before placing any laterals select *Settings/Irrigation – Design Specific*. Check the “Create Wetted Radii” and “Create Sprayline Outlets” check boxes (under normal circumstances “Create Sprayline Outlets” should be unchecked as the number of outlets may be high and will consequently slow down redrawing of the design). Now go to the *Layers* tab and scroll down until you see “SPRAYLINE_OUTLETS”. Check the box to turn this layer on (this layer can also be turned on in *View/Sprayline Outlets*). Click [OK].
8. Drawing in each sprayline would be very tedious, we can however enter a block of connected spraylines (laterals) by selecting a polygon and ‘applying’ the required block properties to it. To do this use the *Tool/Select Object* menu (or click on the icon  on the left-hand tool bar) and click on the rectangle edge (it should change colour) and then select *Zone/Spray Irrigation Block*. Click [OK] on the message asking if you want to create block entities from the selected item. A dialog for setting the lateral and block properties will now be displayed. As you are completing a new design we want IRRICAD to size the laterals so leave the pipe as **Computer Selected**. The laterals will be placed at ground level so the “Depth” field can remain at **0.0**.
9. In the same dialog, select the **Microsprinkler 360 degrees** and click on it to select it. Select the **WHITE 360** as the nozzle in the “Nozzle” field, highlighting the required nozzle and left-clicking the mouse. Enter a pressure of **18.5psi (14m)**.
10. Selecting a riser (outlet connector) is optional but in this example we will use a Microsprinkler stake and tube 3/8” (10mm). In the same dialog, select the **Microsprinkler stake and tube 3/8” (10mm)** from the “Riser” dropdown list.
11. Enter the “Lateral Spacing” as **13ft (4m)**. Enter the “Outlet Spacing” as **11.5ft (3.5m)**.

12. Select the [Options] button and check “User Defined” for the “Lateral Direction”, make sure that the option checked for “Reference Outlet” is “Determine Automatically”. Click [OK].
13. Set the outlet spacing type to “Rectangular” with an “Offset” of 0%. The dialog should look like Figure SM 3.

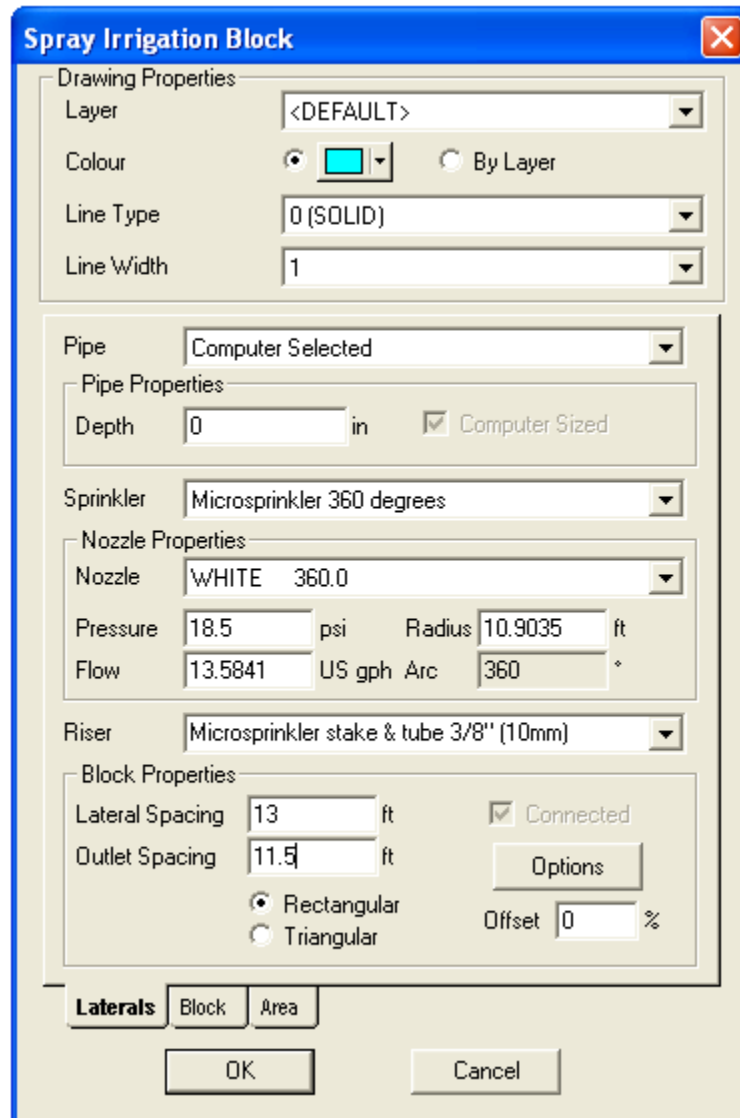


Figure SM 3

14. Now click on the **Block** tab, this tab contains options for automatically placing submains and control valves.
15. Leave the “Submain” as **Computer Selected** and select **Start** from the “Position” dropdown box. Select the **3” (80mm) Electric Valve** from the “Control Valve” dropdown and select **Centre** as the “Position”. Enter a “Submain Stub” of **5ft (1.5m)**. Click [OK].
16. Because we selected “User Defined” for the “Lateral Direction” we now have to enter two points that define the direction (this will be indicated in the bottom left of the status bar). *Right-click|Snaps|Endpoint* and click on the left top corner of the rectangle. Now you will

notice that the status bar is asking for the 2nd point in the block lateral. *Right-click|Snaps|Endpoint* and click on the bottom left corner. Once this is completed the laterals are automatically drawn, with a submain at the top of the block and a central valve with a **5ft (1.5m)** stub, as in Figure SM 4.

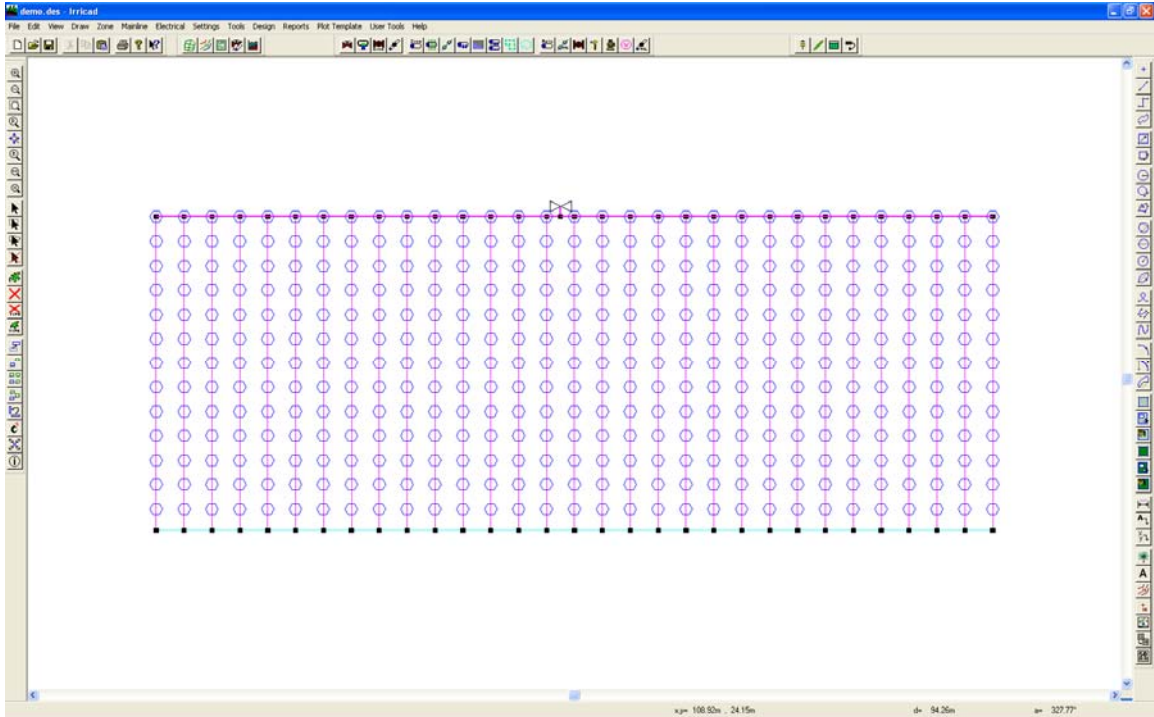


Figure SM 4

17. Now we are ready to design the Mainline. Select *Mainline|Pipe*. Set the pipe as **Computer Selected**, the “Depth” as **0** and the “Line Width” as **3**. Click **[OK]**. Connect the pipe to the control valve by clicking on it and then draw the mainline pipe out upwards for approximately **33ft (10m)**. Note that the status bar indicates the distance travelled since the last left-click via the ‘d=’ field. Left-click to place the end of the pipe and then *Right-click|Restart*.
18. Select *Mainline|Water Supply*. Connect to the junction on the left end of the mainline pipe. Accept the default name of Supply No. 1. Do not enter any flow or pressure requirements (IRRICAD will assume that the water supply is unrestricted and will determine these requirements during design and analysis). Click **[OK]**. Select *File|Save* and save the design as demo.des. Your design should look like Figure SM 5. This completes the entry of the hydraulic components of the design.

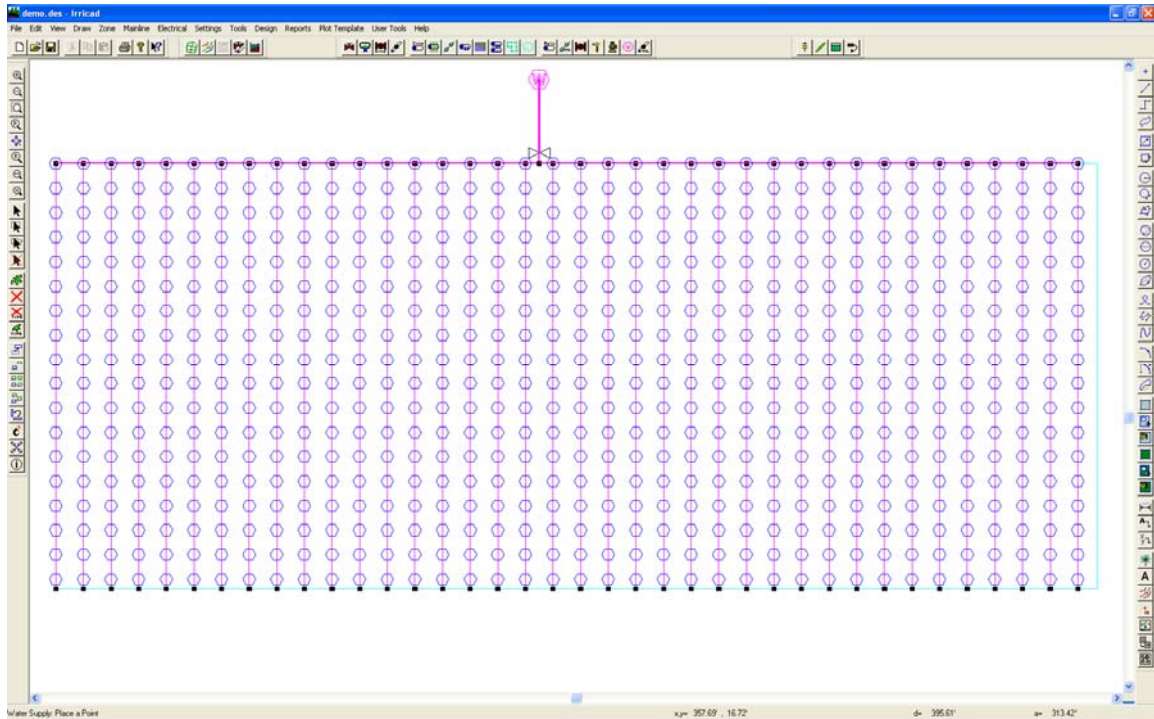


Figure SM 5

ENTERING MANAGEMENT REQUIREMENTS

19. The primary purpose of management is to allow you to specify an operating sequence for the zone control valves. This operating sequence is then used to set up a series of flow conditions so that the mainline can be correctly sized and analysed.

Checking Connections

20. First, select *Design|Check Outlet Connectivity*. If everything is connected, proceed with Design. This tool is optional but is recommended for new users and for complex designs. Any unconnected items will be marked with a red cross in a circle. These can be removed by selecting *Design|Clear Connectivity Marks*.
21. If any outlets or control valves are marked as unconnected, check that you cannot see a black junction where the outlet, control valve or water supply connects to the pipes (use *View|Zoom Window* and draw a window where you want to zoom in). If you see a black junction at either of these points, it is because the valve, water supply or outlet is not connected to the pipe. Select the valve, water supply or outlet (*Tools|Select Object* and click on the item) and move the item to the centre of the junction (*Tools|Move* and click on the item). The junction will disappear when the item is connected to a pipe. If you are still having trouble with the connection, check the "Default Snap Mode" in *Settings|Snap* is "Connect". Another reason items might not connect is that you are trying to connect zone items on to mainline items or vice versa. Remember a control valve is required between zone and mainline items.

Assigning Zones

22. Select *Design|Assign All Zones to One System Flow*. IRRICAD assigns Area no. 1 to operate on System Flow 1 as in Figure SM 6. The on and off times (one hour operating time), for the system flow, are automatically listed. Click [OK]. We are now ready to proceed with the design process.

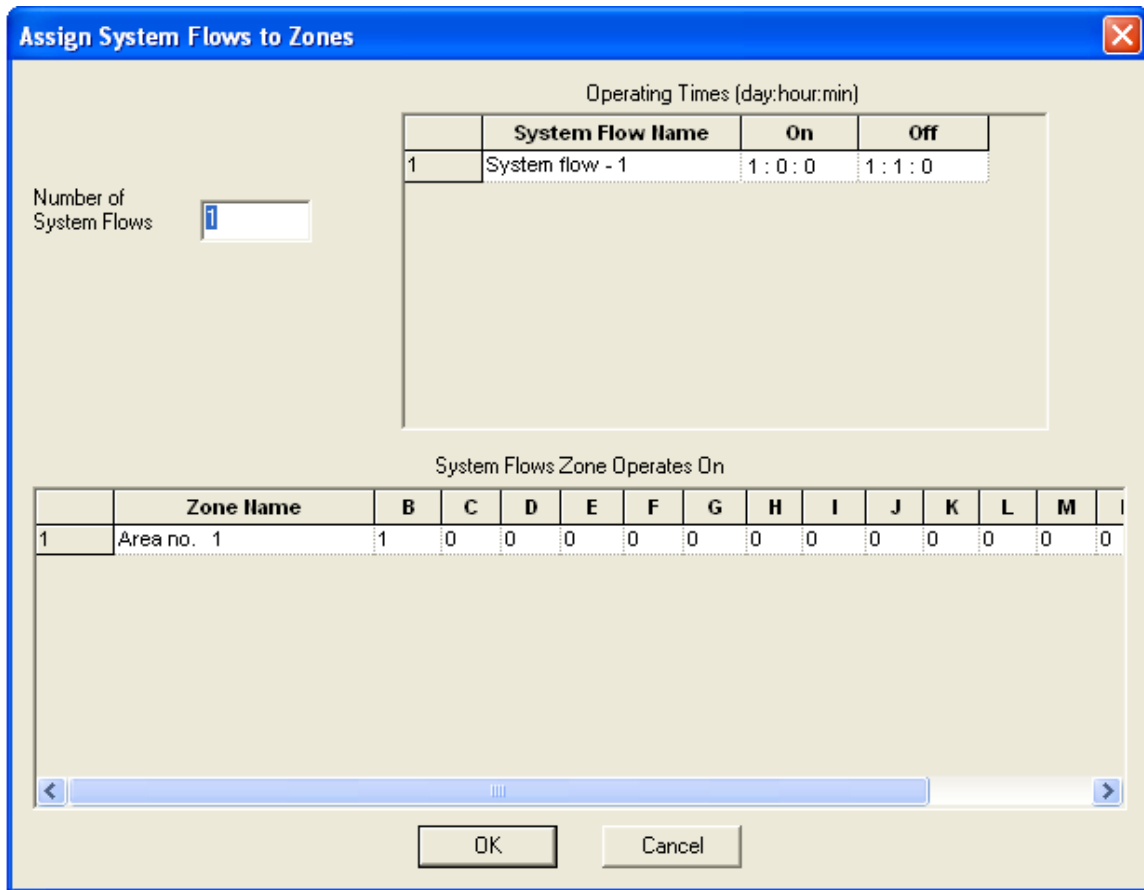


Figure SM 6

THE DESIGN PROCESS

23. Select *Design|Design Parameters|Hydraulic Parameters* and set the "Maximum Zone Pipe Velocity" to **5ft/s (1.5m/s)**. Click [OK].
24. Select *Design|Zone Design|LP Design*. This method of computer sizing takes into account the maximum allowable velocities (in *Design|Design Parameters|Hydraulic Parameters*) and the pressure requirements of the sprinklers. Select this option to have IRRICAD size the laterals and submain for the zone.
25. You will notice that 5 pipe sizes have been selected for the submain. In order to simplify installation we will limit the number of pipe sizes that can be selected for the submain. Select *Design|Zone Design Configuration* and enter **3** in the "Number of Submain Sizes" column. Click [OK] and re-run *Design|Zone Design|LP Design*.
26. Select *Design|Valve Analysis* to have IRRICAD calculate the pressure losses through the zone control valve, this usually runs very quickly.
27. It is advisable to check the data in the zone reports after zone design (*Reports|Zone Design Reports*). At this stage the Zone Design Summary report gives a good indication of the overall design performance of the zone, showing the allowable range and actual minimum and maximum outlet flows and pressures. Click on the [X] to close the report window.

28. Having completed the valve analysis, you can now have IRRICAD size the mainline, to do this select *Design|Mainline Design|LP Design*. IRRICAD will then size the mainline and calculate the water supply pressure necessary to ensure that the zone control valve receives the required pressure. You should have results similar to Figure SM 7.

Zone Name :	Area no. 1		Valve Description :	3" (80mm) Electric Valve	
Zone Head (D/S) :	20.63	(psi)	Zone Head (U/S) :	20.95	(psi)
Total Zone Flow :	98.26	US gpm	Valve Headloss :	0.32	(psi)
	Allowable Flow	Actual Flow	Allowable Pressure	Actual Pressure	
	US gph	US gph	(psi)	(psi)	
Minimum Outlet	12.90	13.01	16.44	16.74	
Maximum Outlet	14.26	14.20	20.70	20.50	
Outlet Variation (%)	9.52	8.42	20.59	18.33	
Outlet Locations (X,Y)	Minimum :	5.3 , 24.1	Maximum :	37.0 , 69.8	

Figure SM 7

DISPLAY REPORTS

29. You may wish to view some of the design reports. As described previously the Zone Design Summary Report (*Reports|Zone Design Reports*), detailed in Figure SM 8, shows a summary of the pressure variation in the block.

Zone Name :	Area no. 1		Valve Description :	3" (80mm) Electric Valve	
Zone Head (D/S) :	20.63	(psi)	Zone Head (U/S) :	20.95	(psi)
Total Zone Flow :	98.26	US gpm	Valve Headloss :	0.32	(psi)
	Allowable Flow	Actual Flow	Allowable Pressure	Actual Pressure	
	US gph	US gph	(psi)	(psi)	
Minimum Outlet	12.90	13.01	16.44	16.74	
Maximum Outlet	14.26	14.20	20.70	20.50	
Outlet Variation (%)	9.52	8.42	20.59	18.33	
Outlet Locations (X,Y)	Minimum :	5.3 , 24.1	Maximum :	37.0 , 69.8	

Figure SM 8

30. The System Duty Report (*Reports|Mainline Design Reports*) shows the duty required at the water supply. The Mainline Summary Report is a summary of actual and required pressures at the zone control valve.
31. Other tools that may be helpful, particularly in undulating blocks, are described below.
32. The hydraulic gradeline tool (*Reports|Hydraulic Gradeline*) allows you to click on a lateral or submain pipe and see a graphical display of the pressure along that section of pipe. For more information on this tool see the Release Notes (*Help|Release Notes*). Another useful tool, *Reports|Show Pressure Zone Limits*, shows visually the location of the emitters with the minimum and maximum pressure within a zone.
33. If you have had trouble doing this design, please check the following:
34. Size of the rectangle – select *Tools|Change* and click on the rectangle boundary to check the “Height” and “Width” are **390 x 150ft (120 x 45m)**.

35. Note this tutorial could be repeated using the *Zone/Tape Irrigation Block* tool for Drip tape blocks.