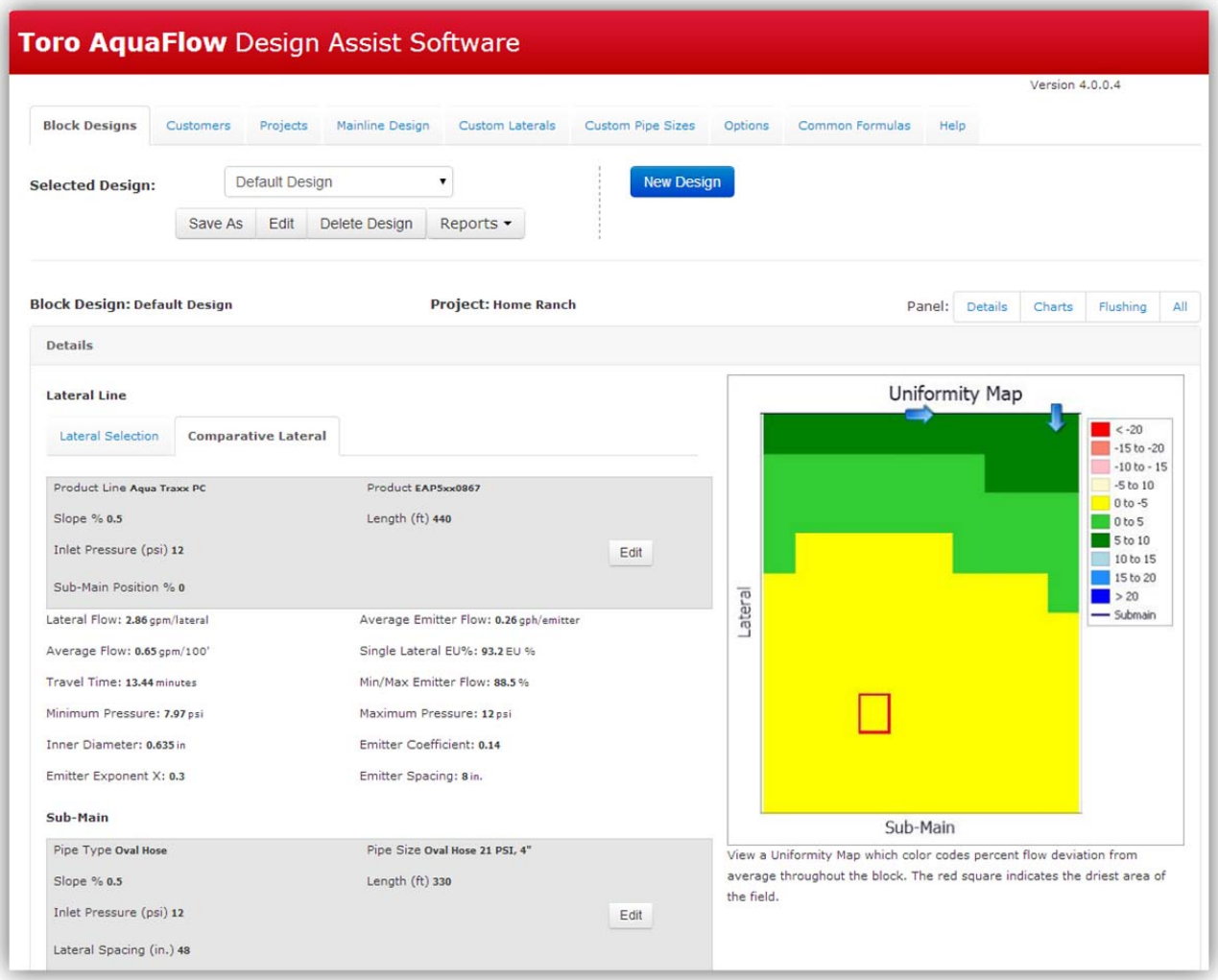
TORO. Count on it.

Micro-Irrigation Business

AquaFlow User's Manual

May 2014



Drip Irrigation Design Program

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Welcome to AquaFlow, Toro's drip irrigation design software. For your convenience, AquaFlow is now available for use online or can be downloaded to your computer for offline use at toro.com or driptips.toro.com. A summary of AquaFlow's capabilities include:

1. NEW: Ability to create designs both offline and online at toro.com or driptips.toro.com without the need to download to your computer.
2. NEW: A user-friendly welcome screen that automatically formats to multiple screens and font sizes, and includes expandable panels that reveal instant results, including a color-coded Uniformity Map. Design functions include Laterals, Submains, Lateral/Submain Flushing, and Mainlines.
3. NEW: Pull-down menus to allow easy creation of Customers and Projects, and easy selection of Mainline Design, Custom Laterals and Pipes, Options, Common Formulas, and Help. To enable the Custom Laterals feature, contact aquaflow@toro.com
4. NEW: Report of lateral quantity per block, number of laterals per block, and submain and mainline irrigation travel time.
5. NEW: Chart of submain velocity vs. distance.
6. NEW: Ability to enter data for custom submain and mainline pipe sizes. To enable this feature, contact aquaflow@toro.com
7. Lateral choices include Toro's Aqua-Traxx® and Aqua-Traxx® PC premium drip tape, Neptune flat emitter dripline, BlueLine® Classic and BlueLine® PC premium dripline, and Custom Laterals.
8. Submain and Mainline choices include Toro Oval Hose and Layflat, and multiple types and sizes of PVC pipe.
9. Multiple-slopes may be entered for laterals, submains, and mainlines.
10. Submains and mainlines may be telescoped with multiple pipe sizes.
11. Two laterals may be easily compared.
12. Designs may be easily saved, exported and imported.
13. Reports may be printed/saved to pdf.
14. Choose either English or Spanish language.
15. Choose either Standard or Metric units.

The Lateral, Sub-Main, Flushing and Mainline functions require input from the designer. Once data is entered and saved, output data appears in the panels, and a uniformity map appears. The following summarizes the Lateral, Submain, Flushing, and Mainline inputs and outputs:

1. Lateral:
    a. Input: Product Model, Slope(s), Length, Inlet Pressure, Sub-Main Position
    b. Output: Lateral flow, Emitter Flow, Average Flow, Single Lateral Emission Uniformity, Travel Time, Min/Max Emitter Flow, Minimum Pressure, Maximum Pressure, Inner Diameter, Emitter Coefficient, Emitter Exponent X, Emitter Spacing.
2. Sub-Main:
    a. Input: Pipe Type, Pipe Size(s), Slope(s), Length, Inlet Pressure, Lateral Spacing.
    b. Output: Block Flow, Block Emission Uniformity, Minimum Lateral Flow, Maximum Lateral Flow, Min/Max Lateral Flow, Minimum Pressure , Maximum Pressure, Inner Diameter, Roughness Coefficient, Block Size, Block Flow, Precipitation Rate, Length of Tubing per acre, Length of Tubing per Block, Number of Laterals per Block, and Irrigation Travel Time.
3. Flushing: Lateral and Sub-Main
    a. Input: End Pressure, Flushing Velocity, Inlet Pressure
    b. Output: Velocity, Inlet Pressure, Lateral Outlet Flow, Emitter Flow, Travel time, End Pressure
4. Mainline:
    a. Input: Pipe Type, Pipe Size, Flow, Length, Pressure, Elevation
    b. Output: Sequence number, Upstream and Downstream Elevation, Upstream and Downstream Pressure, Flow, Friction Loss, Velocity, Travel Time, Slope, Length, Pipe Type and Pipe Size.

Getting Started

1. AquaFlow is available for use online and/or download for all Registered Users. To become a Registered User, accept the User Agreement and fill out the fields in the Registration Application Form. In most cases, a Registration Application will be viewed within 48 hours, and in many cases, much sooner. You will receive an email when your Registration is approved - AquaFlow is then ready for use! If AquaFlow is downloaded, then an icon will appear on your desktop.
2. Upon launch, a Default Block Design will appear with lateral, sub-main, and flushing selections already made, along with output values, graphs, and a color-coded Uniformity Map. This Default Design may then be edited, or you

can create a New Design. Customers, Projects and Mainline designs may also be created.
3. You will be alerted to future upgrades to AquaFlow via the email address provided during registration. You will not be required to Uninstall and re-upload the program to install routine upgrades.
4. The Help Menu provides many of the formulas used to generate the output calculations in AquaFlow.
5. About AquaFlow at the bottom of the Welcome screen identifies the AquaFlow version in use.
6. Toro AquaFlow is Copyright©2014 by The Toro Company. All Rights Reserved.

Introduction to Drip Irrigation and Design

Micro-Irrigation, also commonly called drip irrigation, is the fastest growing irrigation technology in the Unites States. It was commercially introduced over four decades ago, and its usage has since spread to 3.5 million acres of diversified farmland throughout the US as of 2008 (USDA, 2008). Farmers adopt drip irrigation because their crops respond well to the spoon feeding of water and nutrients directly to the crop's rootzone, and because valuable resources are conserved and/or optimized. These benefits improve farm income and reduce farm costs enough to pay for the investment quickly. In addition, runoff, wind drift and deep percolation of irrigation water is minimized, and access to the field is improved compared to other irrigation methods. Figure 1 graphically describes these benefit for fruit, nut and vegetable crops, and Figure 2 for field crops.

Drip irrigation differs from gravity and sprinkler irrigation in a number of ways. A drip system consists of a network of plastic pipes and emission devices that deliver pressurized water directly to the soil at a low pressure and low flow rate. It is typically operated at frequent intervals, and the duration of operation may be adjusted to accomplish numerous changing objectives. Source water is filtered to prevent clogging of drip system emission devices, and chemical injection systems are used to apply fertilizers, crop protection materials and drip system maintenance chemicals. (Stetson, 2011). Figure 3 shows a Typical Drip System Layout for field crops (corn), row/vegetable crops (lettuce), vineyards (grape vines) and orchards (almond trees).

Although all irrigation system types share some basic hydraulic principles and equipment, such as pumps and delivery pipe, there are also differences that

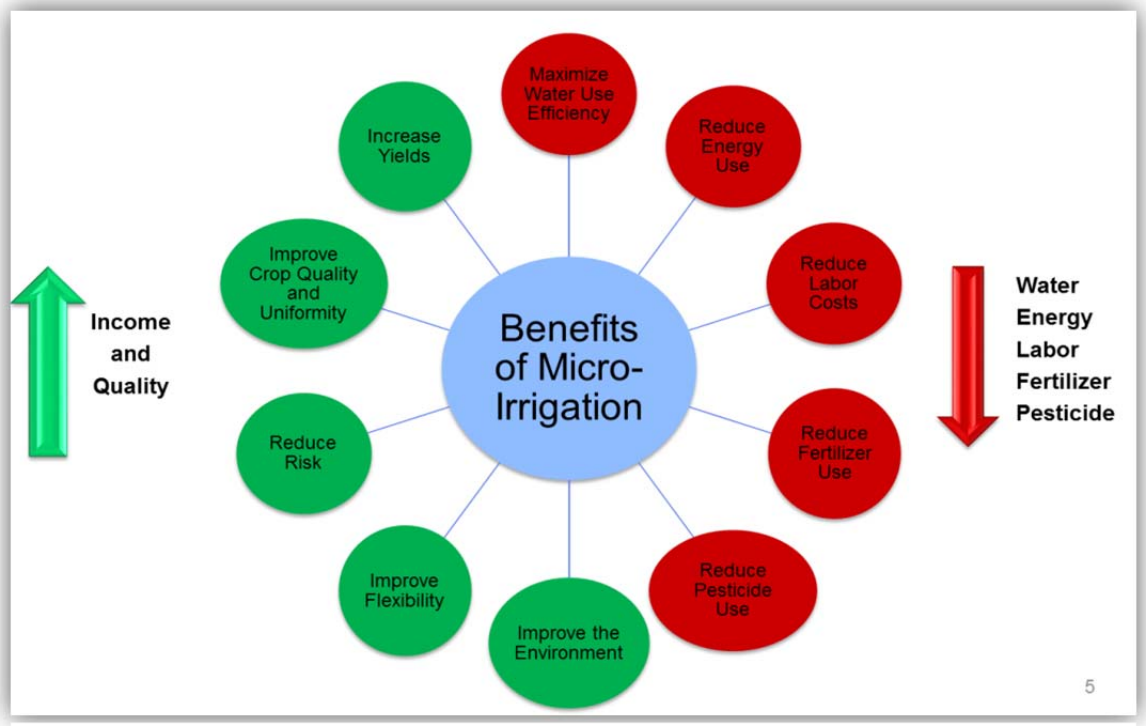


Figure 1 - Benefits of micro-irrigation for fruit, nut, and vegetable crops.

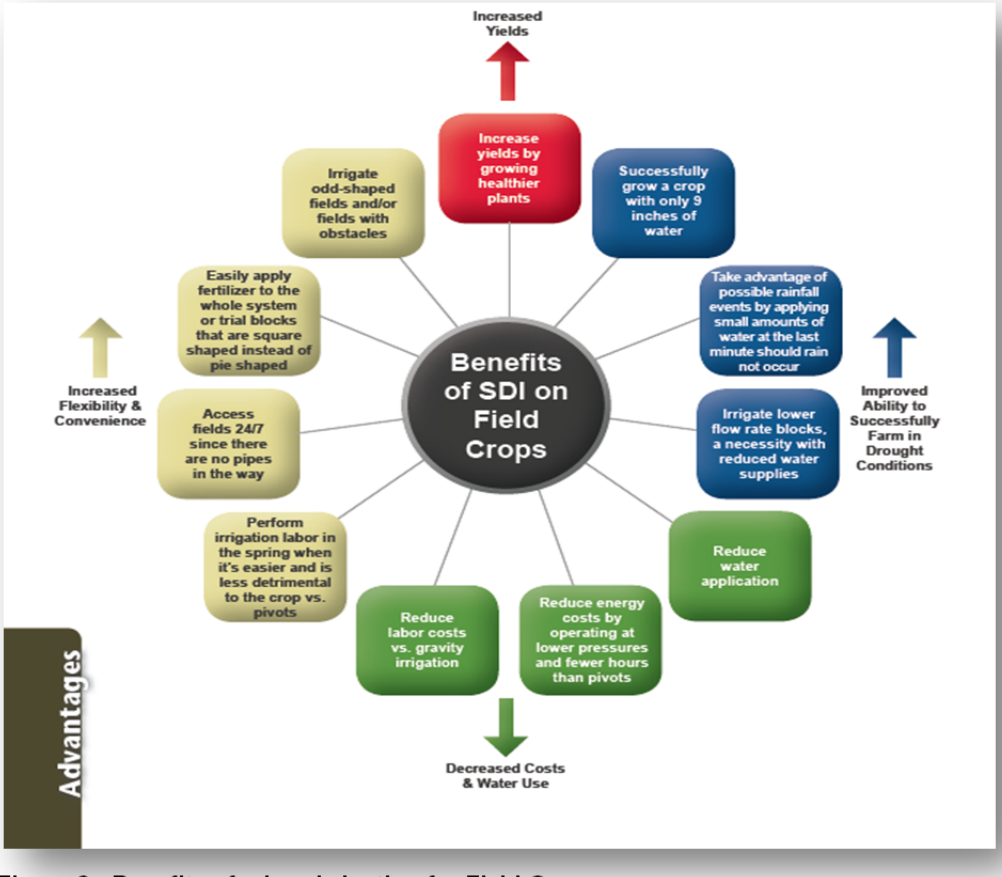


Figure 2 - Benefits of micro-irrigation for Field Crops.

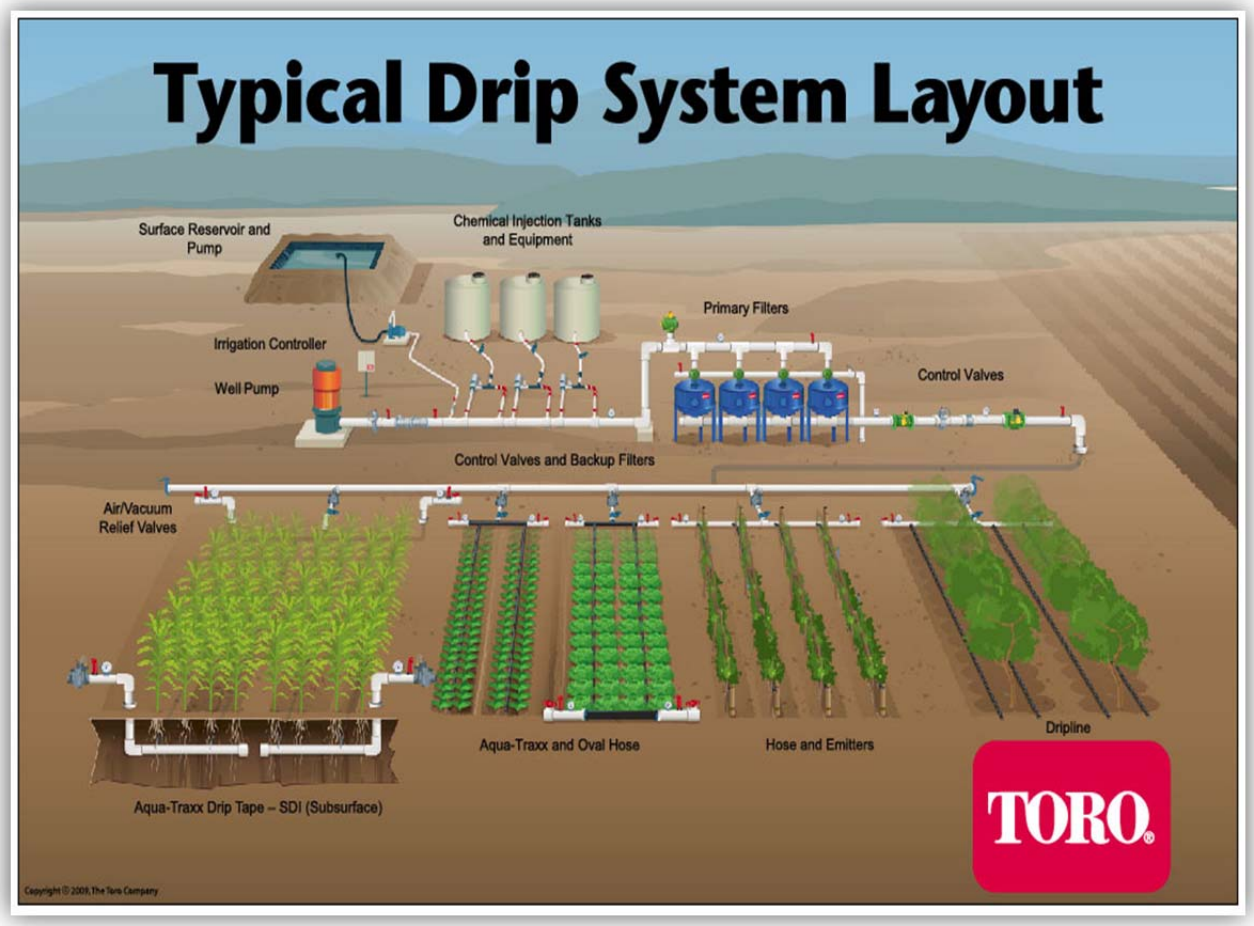


Figure 3 - Typical Drip System Layout

require specialized knowledge for design, installation, operation, and maintenance of the system. The primary job of a drip irrigation system designer is to choose the right types and sizes of system components to ensure that the system applies water uniformly to each plant, and so that the system may be flushed and maintained to ensure a long life. Prior to the availability of software, designers manually calculated friction loss and flow uniformity, or used charts and nomographs developed for this specific purpose. With the introduction of consumer computers, early versions of drip irrigation design software automated many of these tasks and allowed a higher level of accuracy.

Today, drip irrigation design has never been easier or more accurate. AquaFlow takes advantage of recent advancements in computer processing, programming techniques and display screen technology to optimize drip irrigation design. Designers can now evaluate more selection options more quickly, and with more accuracy than ever before, thus improving the decision-making process for

selecting drip irrigation system components. This results in better, more cost effective drip irrigation system performance, and improved return on investment (ROI) for the farmer.

5-Step Quick Start Guide

Welcome to Toro's AquaFlow drip irrigation design program!

In five easy steps, you can quickly view the results of drip irrigation lateral, submain, mainline, and flushing parameter selections. Before starting a block design, create Customers and Projects so that block and mainline designs may be saved and associated with one another for easy recall and report generation.

Step 1. Lateral Line

a. Click on Lateral Selection, and then Edit
b. Choose a Product Line
c. Choose a Product
d. Enter the Slope(s)
e. Enter the Inlet Pressure
f. Enter the Length of Run
g. Enter the Submain Position
    - Click on Auto Position to allow the program to find the submain field position that delivers the highest emission uniformity, or
    - Enter 0 to place the submain at the top of the field, or
    - Enter another number to manually position the manifold
h. Click on Save and then view results, product details, charts and a uniformity map including:
    - Results: Lateral Flow, Emitter Flow, Average Flow, Single Lateral Emission Uniformity, Travel Time, Min/Max Emitter Flow, Minimum Pressure, Maximum Pressure, Inner Diameter, Emitter Coefficient, Emitter Exponent X, Emitter Spacing
    - Charts: Lateral Velocity, Pressure, Elevation and Emitter Flow vs. Distance
i. To compare the selected lateral results with a different lateral selection, click on Comparative Lateral, repeat steps above, and then toggle back and forth to compare results, and/or print results

Step 2. Submain Manifold

a. Click on Edit and then choose a Submain Pipe Type and Pipe Size
b. Enter the Slope(s)
c. Enter the Submain Length of Run
d. Enter the Submain Inlet Pressure
e. Enter the Spacing Between Laterals that the submain is supplying
f. Click on Save and then view results:
    - Results: Block Flow, Block Emission Uniformity, Minimum Lateral Flow, Maximum Lateral Flow, Min/Max Lateral Flow, Minimum Pressure, Maximum Pressure, Inner Diameter, Roughness Coefficient, Block Size, Block Flow, Precipitation Rate, Length of Tubing per acre and per block, Number of Laterals per Block, and Irrigation Travel Time
    - Charts: Submain velocity, pressure and elevation vs. distance

Step 3. Flushing Parameters – Lateral and Submain

a. Enter the required End Pressure, desired Flushing Velocity and a Flushing Inlet Pressure
b. View the following results for both the lateral and the submain according to the Flushing Pressure or Flushing Velocity input:
    - Velocity, Inlet Pressure, Lateral Outlet Flow, Emitter Flow, Lateral Inlet Flow, Travel Time and End Pressure

Step 4. Mainline

a. Select Mainline Design from the toolbar menu
b. Solve for either Upstream or Downstream
c. Select Add to begin entering data for each segment of the mainline
d. View the following results after each segment is added:
    - Sequence Number, Upstream and Downstream Elevation, Upstream and Downstream Pressure, Flow, Friction Loss, Velocity, Travel Time, Slope, Length, Pipe Type and Pipe Size

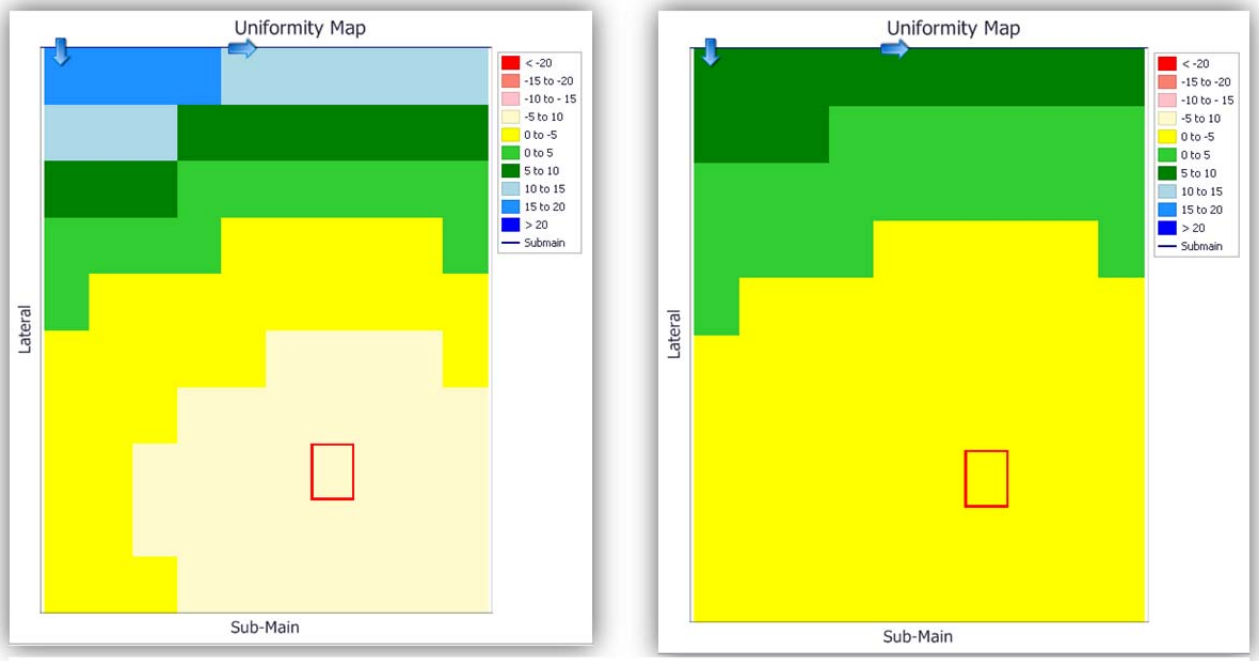
Step 5. View/Print Results

a. View/Print results of any lateral/submain/flushing block design by selecting Reports and then selecting Design.

b. View/Print results of all block designs and mainlines associated with a project by selecting Reports and then selecting Project.

c. The color-coded Uniformity Map illustrates the percent of flow that deviates from the average flow for each of the block designs. It appears on the screen as well as in the block report

The figure below shows that a block design with high uniformity will have fewer colors than a block design with poor uniformity. The figure compares the Uniformity Map from a design using Aqua-Traxx Classic drip tape (on the left) with the uniformity map of a design using Aqua-Traxx PC pressure compensating drip tape (on the right). The design on the right is more desirable because it exhibits less flow variation (or less color variation) than the map on the left.



Uniformity Maps for two different tape designs. The design on the left uses Aqua-Traxx Classic drip tape, the design on the right uses Aqua-Traxx PC drip tape.

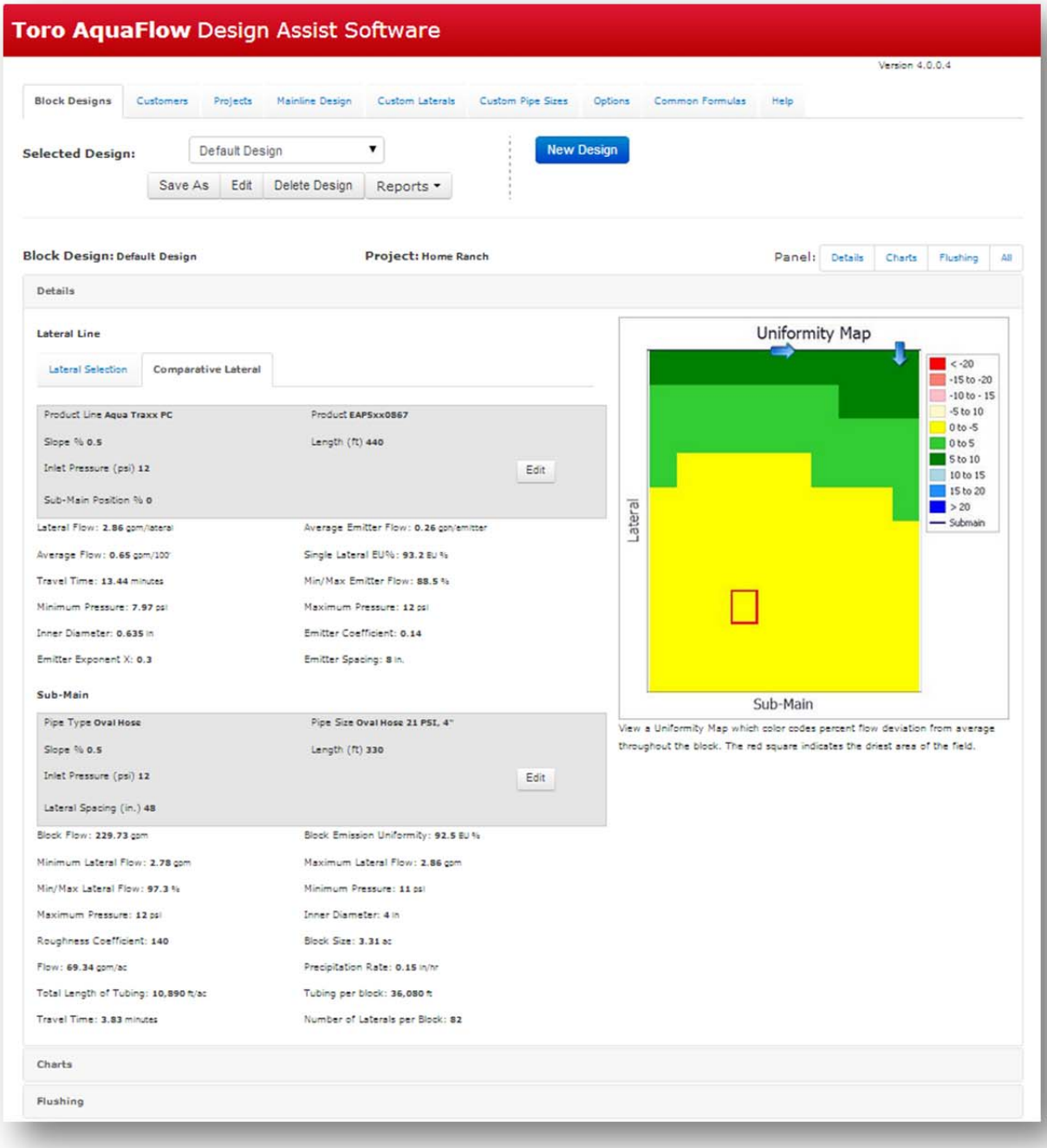
Other Tips:

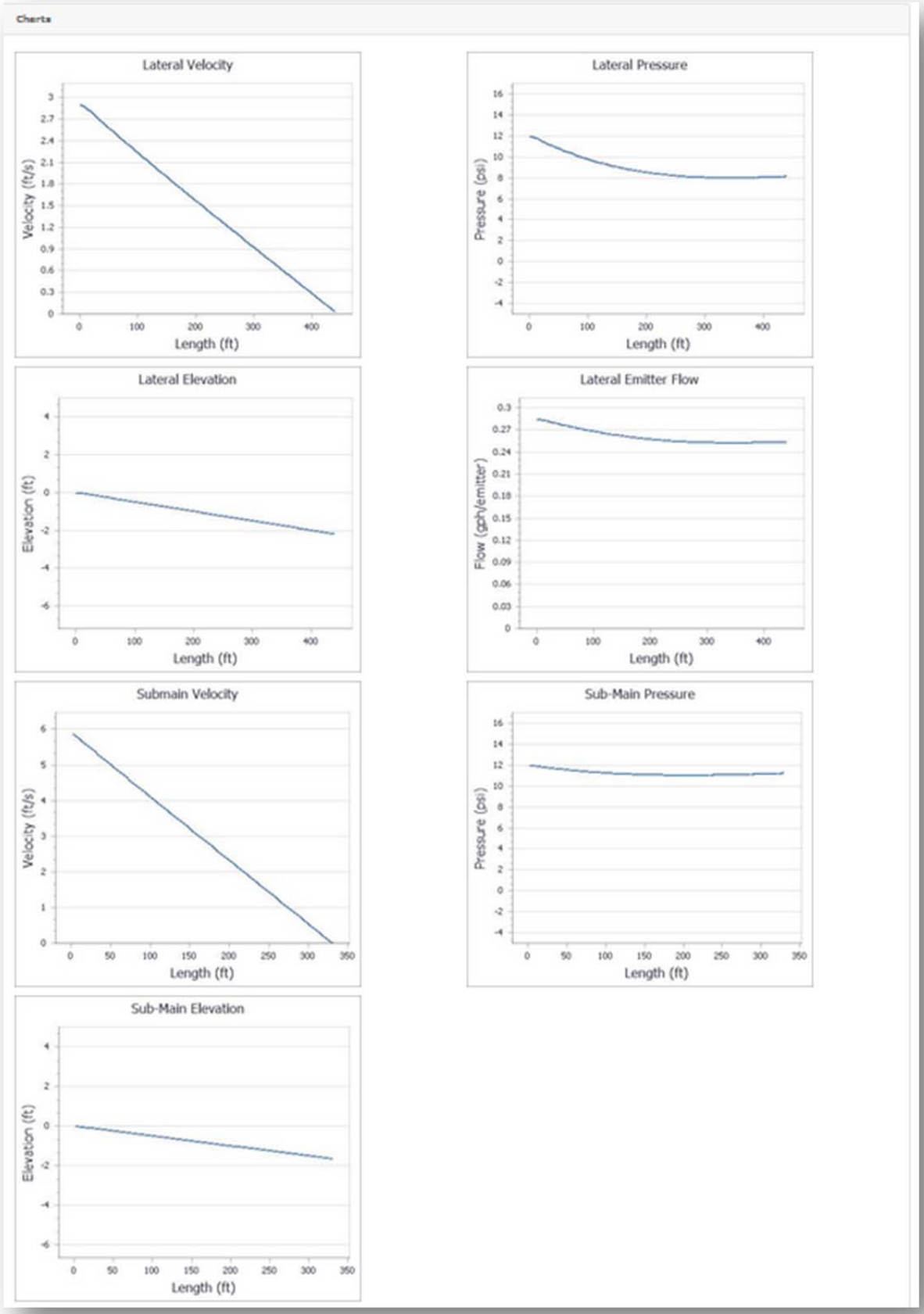
a. Choose Options to:
   - Select language (English or Spanish) and units (Standard or Metric)
   - To upload and download saved designs

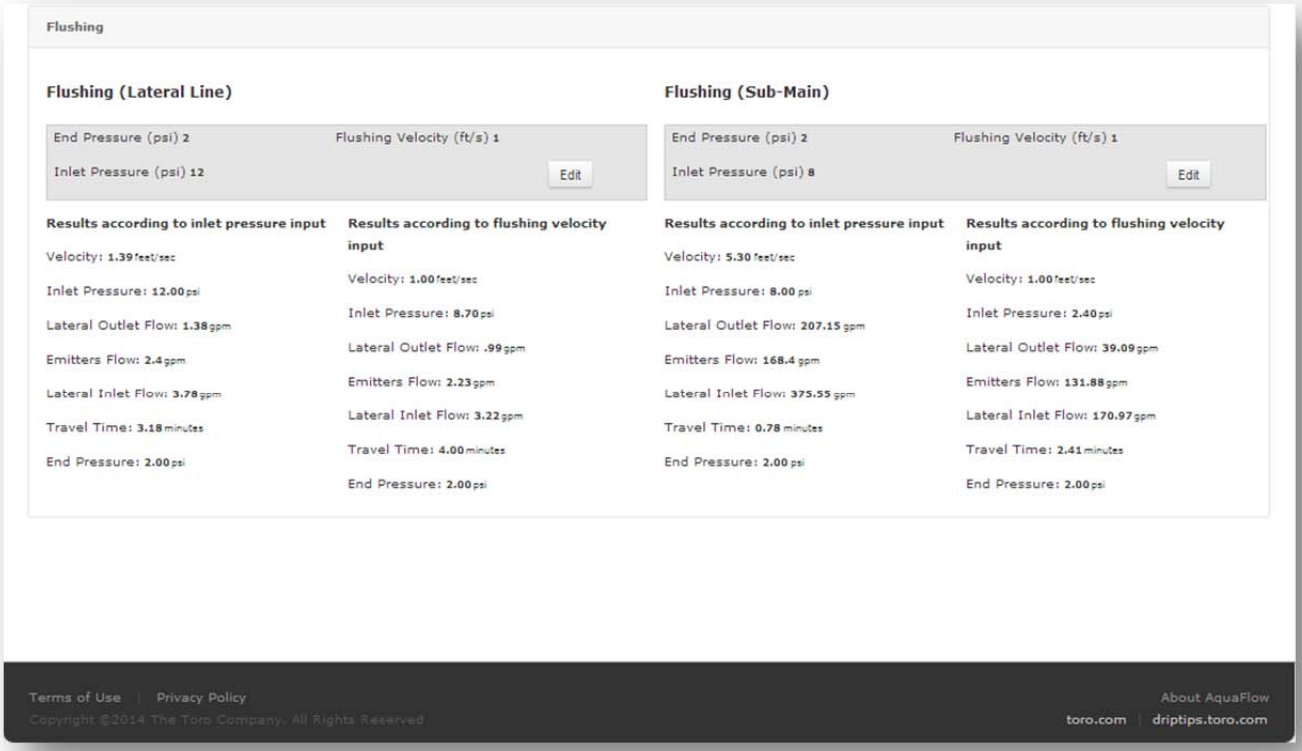
b. Choose Custom Laterals and/or Custom Pipe Sizes to design systems with equipment not available in the pull-down menus. Enter the custom product technical specifications into the fields provided. Once saved, they will appear in the lateral, submain and mainline Custom Product pull-down menus.

c. In Formulas, view the common formulas used to calculate AquaFlow results
d. Scroll to the bottom of the welcome screen to view our Terms of Use and Privacy Policy, and to learn more about AquaFlow, including version information
e. Click on toro.com or driptips.toro.com to access more information about Toro Micro-Irrigation

The following shows the welcome screen panels, and the Options input screen.




Charts
Lateral Velocity
Velocity (ft/s)
Length (ft)
Lateral Pressure
Pressure (psi)
Length (ft)
Lateral Elevation
Elevation (ft)
Length (ft)
Lateral Emitter Flow
Flow (gph/emitter)
Length (ft)
Submain Velocity
Velocity (ft/s)
Length (ft)
Sub-Main Pressure
Pressure (psi)
Length (ft)
Sub-Main Elevation
Elevation (ft)
Length (ft)


Flushing
Flushing (Lateral Line)
End Pressure (psi) 2
Flushing Velocity (ft/s) 1
Inlet Pressure (psi) 12
Edit
Results according to inlet pressure input
Velocity: 1.39 feet/sec
Inlet Pressure: 12.00 psi
Lateral Outlet Flow: 1.38 gpm
Emitters Flow: 2.4 gpm
Lateral Inlet Flow: 3.78 gpm
Travel Time: 3.18 minutes
End Pressure: 2.00 psi
Results according to flushing velocity input
Velocity: 1.00 feet/sec
Inlet Pressure: 8.70 psi
Lateral Outlet Flow: .99 gpm
Emitters Flow: 2.23 gpm
Lateral Inlet Flow: 3.22 gpm
Travel Time: 4.00 minutes
End Pressure: 2.00 psi
Flushing (Sub-Main)
End Pressure (psi) 2
Flushing Velocity (ft/s) 1
Inlet Pressure (psi) 8
Edit
Results according to inlet pressure input
Velocity: 5.30 feet/sec
Inlet Pressure: 8.00 psi
Lateral Outlet Flow: 207.15 gpm
Emitters Flow: 168.4 gpm
Lateral Inlet Flow: 375.55 gpm
Travel Time: 0.78 minutes
End Pressure: 2.00 psi
Results according to flushing velocity input
Velocity: 1.00 feet/sec
Inlet Pressure: 2.40 psi
Lateral Outlet Flow: 39.09 gpm
Emitters Flow: 131.88 gpm
Lateral Inlet Flow: 170.97 gpm
Travel Time: 2.41 minutes
End Pressure: 2.00 psi
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About AquaFlow
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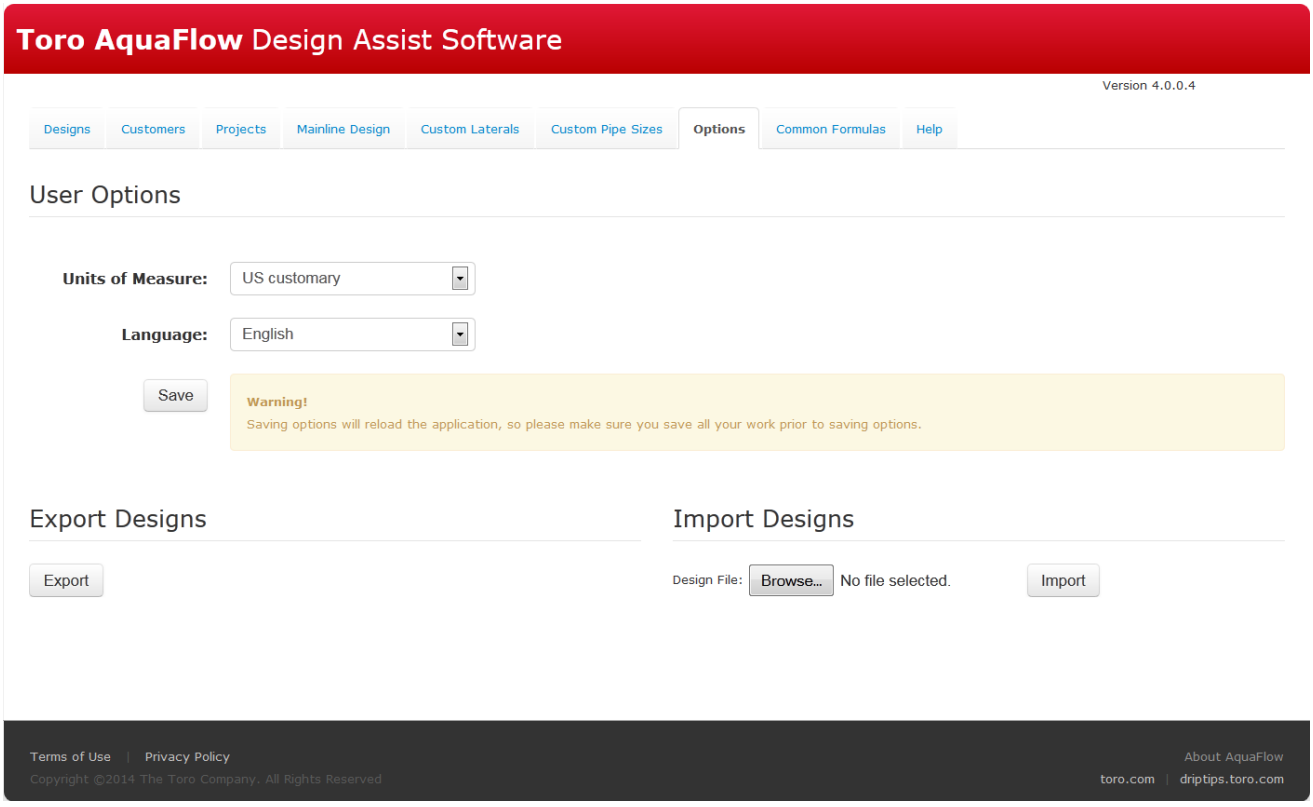
Toro AquaFlow Design Assist Software
Version 4.0.0.4
Designs
Customers
Projects
Mainline Design
Custom Laterals
Custom Pipe Sizes
Options
Common Formulas
Help
User Options
Units of Measure:
US customary
Language:
English
Save
Warning!
Saving options will reload the application, so please make sure you save all your work prior to saving options.
Export Designs
Export
Import Designs
Design File:
Browse...
No file selected.
Import
Terms of Use | Privacy Policy
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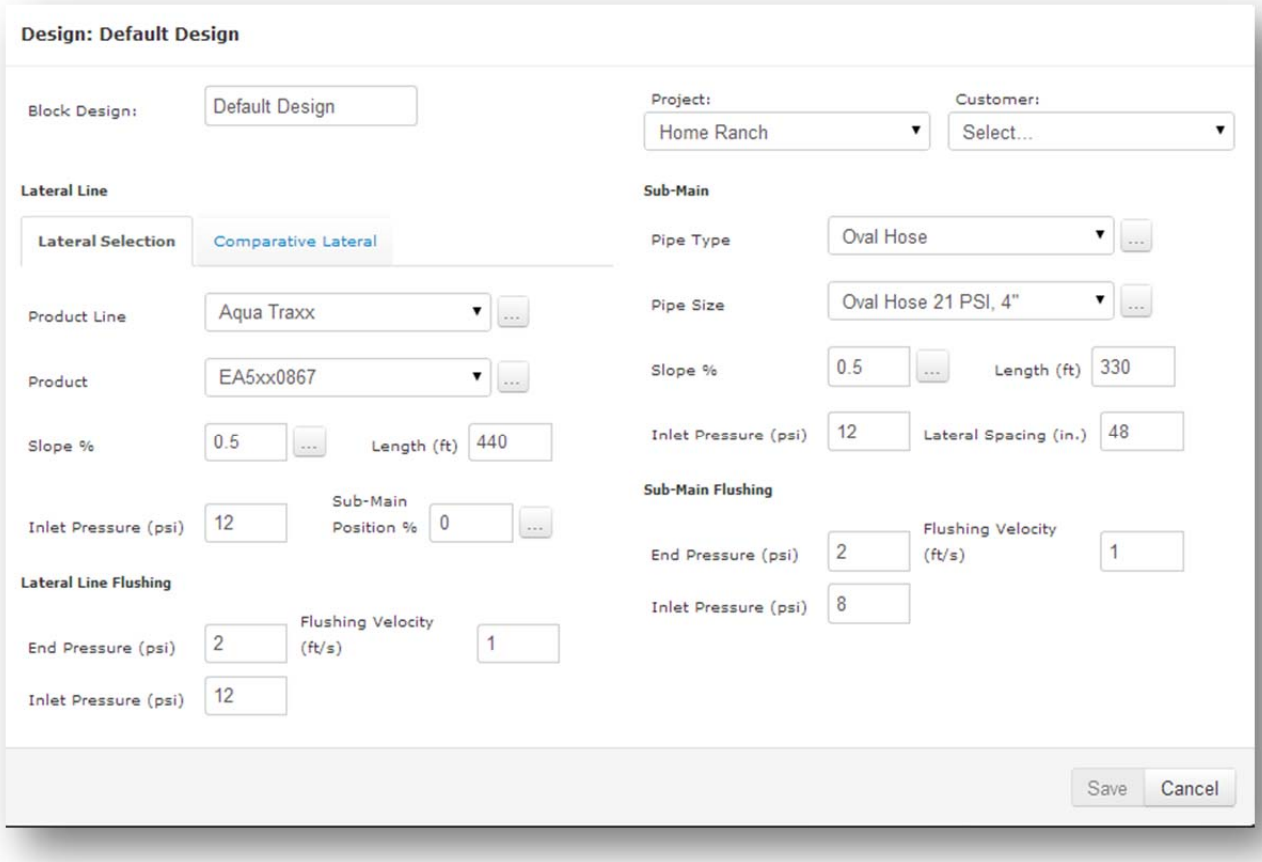
Sample Design

When AquaFlow launches, a default design appears on the screen with inputs already selected and outputs displayed. Click on Edit to review the choices, which appear as follows:



- The Lateral Selection uses Aqua-Traxx Classic drip tape part number EA5xx0867 on a .5% down slope, 440 foot length of run, 12 psi inlet pressure and the sub-main positioned at the top of the field (0%). The Sub-Main is 4" Oval Hose, the sub-main runs along a .5% downhill slope, the sub-main length of run is 330 feet, the sub-main inlet pressure is 12 psi, and the lateral row spacing is 48 inches apart.
    - The resulting Emission Uniformity (EU) for a single lateral line is 90.3%, and the EU for the entire block is 89.4%. All other Output data may be viewed beneath the Input data.

  - The Uniformity Map illustrates percent flow deviation from average for the block using color (yellow, green, and blue, in this case).
  - Select output data also appears in the Charts and Flushing panels.
- The Comparison Lateral uses Aqua-Traxx PC drip tape part number EAP5xx0867 instead of Aqua-Traxx Classic – all other inputs remain the same. Note that the EU for a single lateral is now 93.2%, and the EU for the entire block is now 92.5%. Also, note that the Uniformity Map has improved and shows less color variation.

In this design, a pressure compensating tape helps the designer achieve a uniformity of 92.5% instead of 89.4%, a 3% difference.

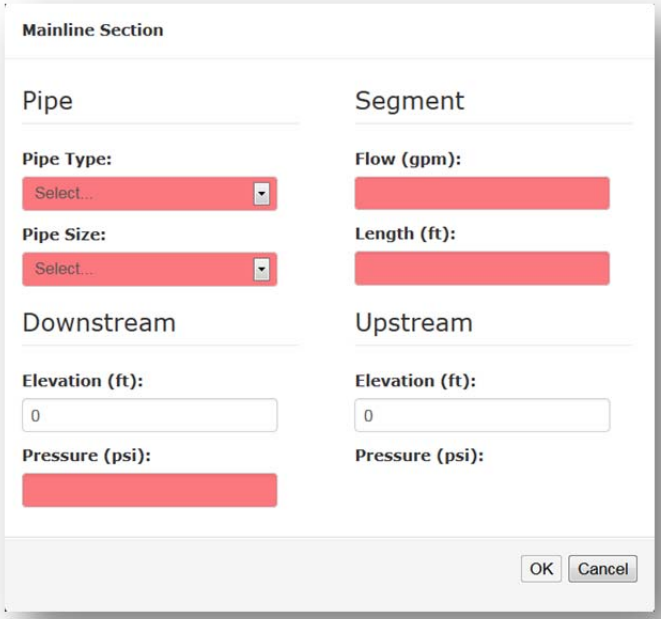
- The Lateral and Sub-main flushing parameter inputs may also be viewed and edited from this screen. In the results, note that the flushing velocity of the lateral is 1.39 feet per second (fps) when the inlet pressure is 12 psi, but that only 8.7 psi is required to achieve a flushing velocity of 1.0 fps.
- As input selections are entered, the Block Charts and Uniformity Maps are updated instantly.

Customers, Projects, Block Designs and Mainline Design

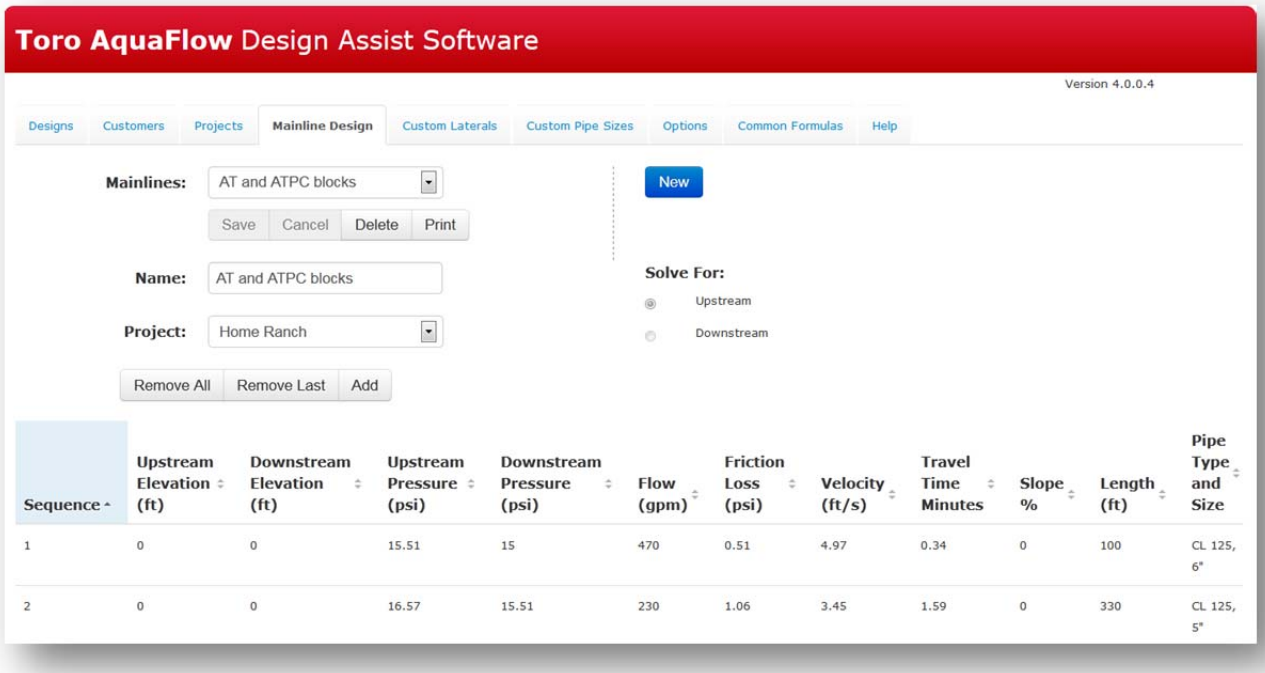
AquaFlow may be used to create individual Block Designs as previously shown, but may also be used to design Mainlines. If the designer wishes to combine block designs with a mainline in report format, then a Customer and Project must be created which can then be associated with the desired block designs and mainline designs.

- First, a Customer is created by choosing Customer from the toolbar menu. This information will appear prior to the block and mainline designs when a Project is printed. Enter the required information and then click on Save and Close.
- Next a Project is created by choosing Project from the toolbar menu. Create a Project name, and then choose the Customer that the Project is associated with. Now click on Save and Close.
- Now, new Block Designs may be created. Name each design, enter the required information, and then click on Save & Close to view the results. If desired, associate the Block Design with a Project.

- To design a mainline, choose Mainline from the toolbar menu, choose New, provide a name for the mainline design, and then choose Add to enter the information required for each mainline segment.



The figure below shows the results of a two segment mainline design that supplies water to the two blocks used in the previous examples. In this example, the pump station is located 100 feet from the 1st block.



The mainline report may then be printed and appears as shown below. If desired, associate the mainline design with a project so that the output may be printed along with the block designs when Print Project is chosen.

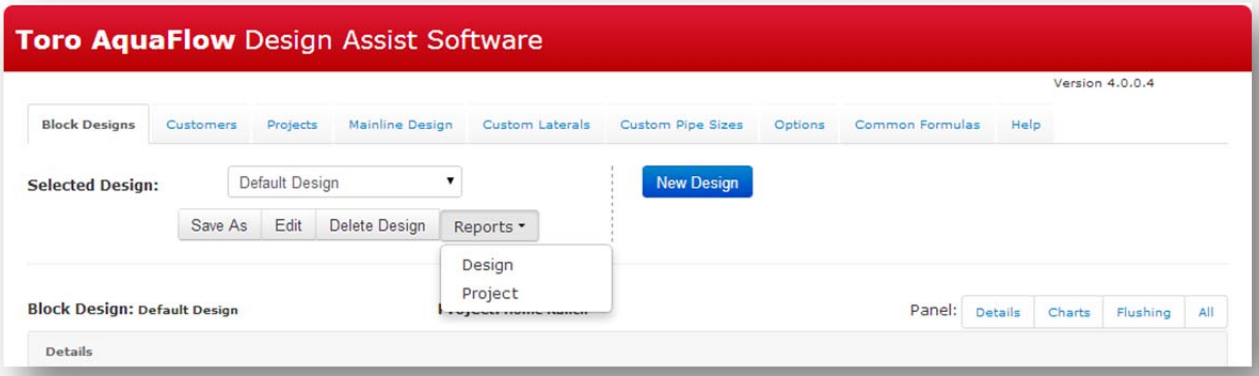
Toro AquaFlow 4.0 Mainline Report

AT and ATPC blocks

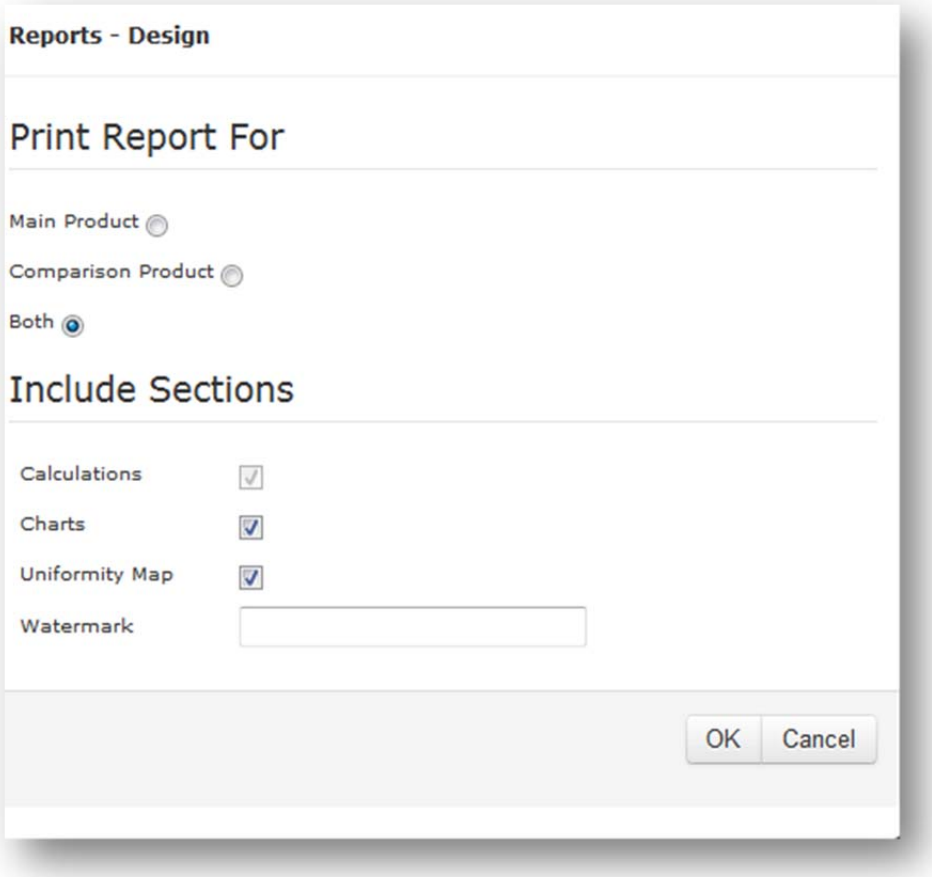
Sequence	Upstream Elevation	Downstream Elevation	Upstream Pressure	Downstream Pressure	Flow	Friction Loss	Velocity	Travel Time Minutes	Slope	Length	Pipe
1	0.00 ft	0.00 ft	15.51 psi	15.00 psi	470.00 gpm	0.51 psi	4.97 ft/s	0.34	0.00 %	100.00 ft	CL 125, 6"
2	0.00 ft	0.00 ft	16.57 psi	15.51 psi	230.00 gpm	1.06 psi	3.45 ft/s	1.59	0.00 %	330.00 ft	CL 125, 5"

Printing Designs and Projects

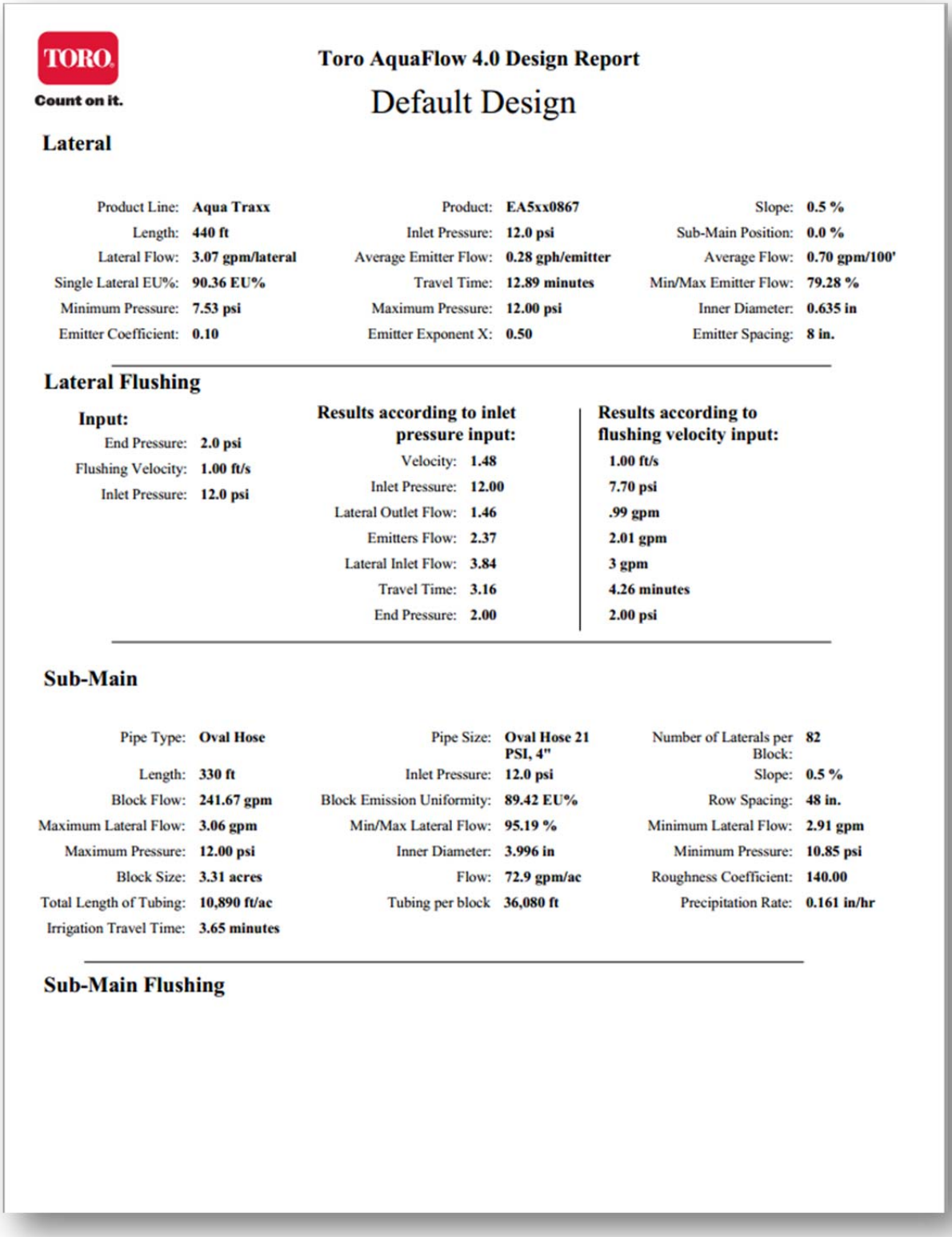
Block designs, mainline designs, and projects may be exported to a .pdf file format. From the Block Designs menu, choose Reports and then choose Design or Project as shown below:



Once Design or Project is selected, the following screen appears, allowing the user to customize the report. After making selections, click on OK.



The report will now appear in a .pdf format and may be saved for further use. The report appears as follows:



TORO
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Toro AquaFlow 4.0 Design Report

Default Design

Lateral

Product Line:	**Aqua Traxx**	Product:	**EA5xx0867**	Slope:	**0.5 %**
Length:	**440 ft**	Inlet Pressure:	**12.0 psi**	Sub-Main Position:	**0.0 %**
Lateral Flow:	**3.07 gpm/lateral**	Average Emitter Flow:	**0.28 gph/emitter**	Average Flow:	**0.70 gpm/100'**
Single Lateral EU%:	**90.36 EU%**	Travel Time:	**12.89 minutes**	Min/Max Emitter Flow:	**79.28 %**
Minimum Pressure:	**7.53 psi**	Maximum Pressure:	**12.00 psi**	Inner Diameter:	**0.635 in**
Emitter Coefficient:	**0.10**	Emitter Exponent X:	**0.50**	Emitter Spacing:	**8 in.**

Lateral Flushing

Input:

End Pressure:	**2.0 psi**
Flushing Velocity:	**1.00 ft/s**
Inlet Pressure:	**12.0 psi**

Results according to inlet pressure input:		**Results according to flushing velocity input:**
Velocity:	**1.48**	**1.00 ft/s**
Inlet Pressure:	**12.00**	**7.70 psi**
Lateral Outlet Flow:	**1.46**	**.99 gpm**
Emitters Flow:	**2.37**	**2.01 gpm**
Lateral Inlet Flow:	**3.84**	**3 gpm**
Travel Time:	**3.16**	**4.26 minutes**
End Pressure:	**2.00**	**2.00 psi**

Sub-Main

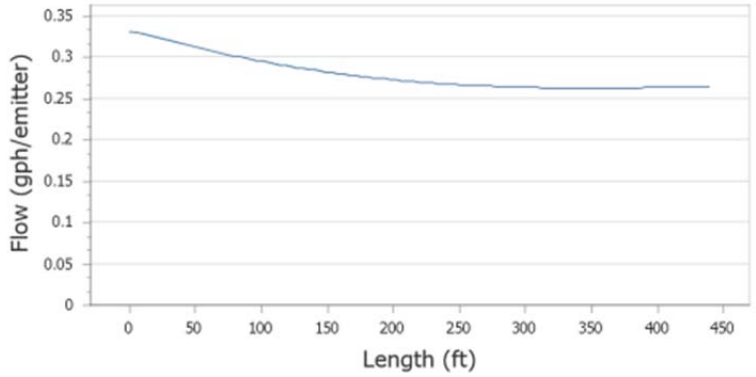
Pipe Type:	**Oval Hose**	Pipe Size:	**Oval Hose 21 PSI, 4"**	Number of Laterals per Block:	**82**
Length:	**330 ft**	Inlet Pressure:	**12.0 psi**	Slope:	**0.5 %**
Block Flow:	**241.67 gpm**	Block Emission Uniformity:	**89.42 EU%**	Row Spacing:	**48 in.**
Maximum Lateral Flow:	**3.06 gpm**	Min/Max Lateral Flow:	**95.19 %**	Minimum Lateral Flow:	**2.91 gpm**
Maximum Pressure:	**12.00 psi**	Inner Diameter:	**3.996 in**	Minimum Pressure:	**10.85 psi**
Block Size:	**3.31 acres**	Flow:	**72.9 gpm/ac**	Roughness Coefficient:	**140.00**
Total Length of Tubing:	**10,890 ft/ac**	Tubing per block	**36,080 ft**	Precipitation Rate:	**0.161 in/hr**
Irrigation Travel Time:	**3.65 minutes**				

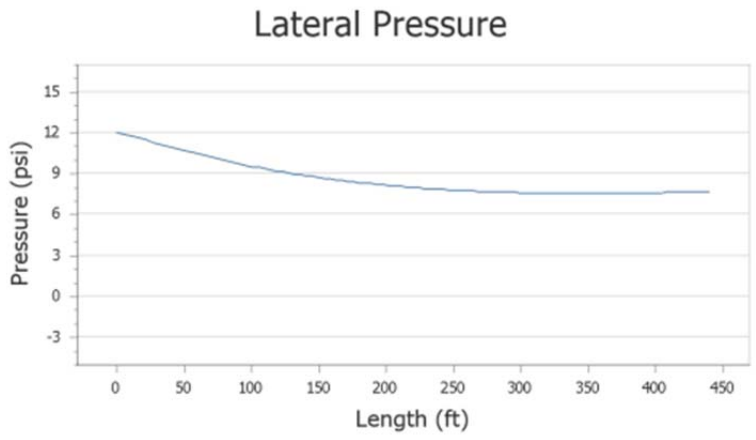
Sub-Main Flushing

Input:	
End Pressure:	**2.0 psi**
Flushing Velocity:	**1.00 ft/s**
Inlet Pressure:	**8.0 psi**

Results according to inlet pressure input:	
Velocity:	**5.59**
Inlet Pressure:	**8.00**
Sub-Main Outlet Flow:	**218.5**
Laterals Flow:	**151.51**
Sub-Main Inlet Flow:	**370.01**
Travel Time:	**0.77**
End Pressure:	**2.00**

Results according to flushing velocity input:
1.00 ft/s
2.10 psi
39.09 gpm
100.07 gpm
139.16 gpm
2.72 minutes
2.00 psi





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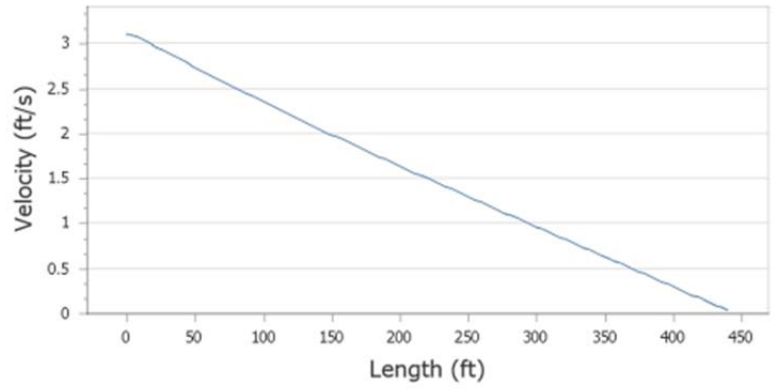
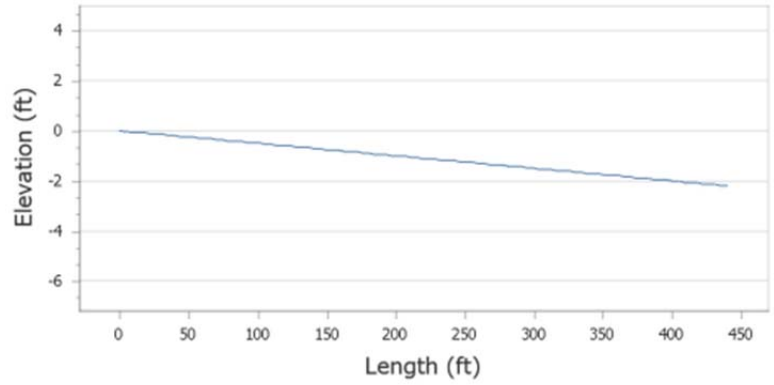
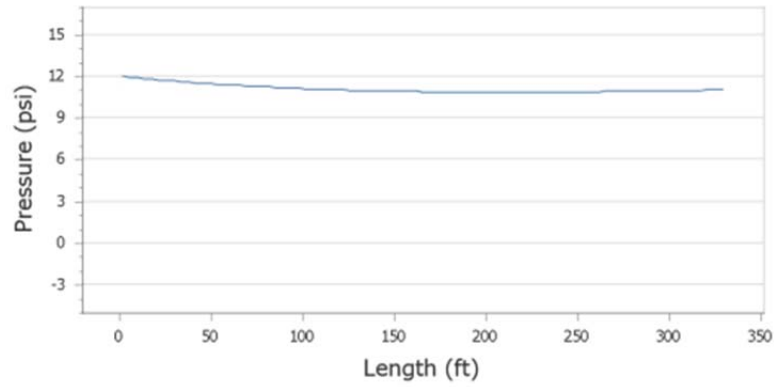


Lateral Elevation



Sub-Main Pressure



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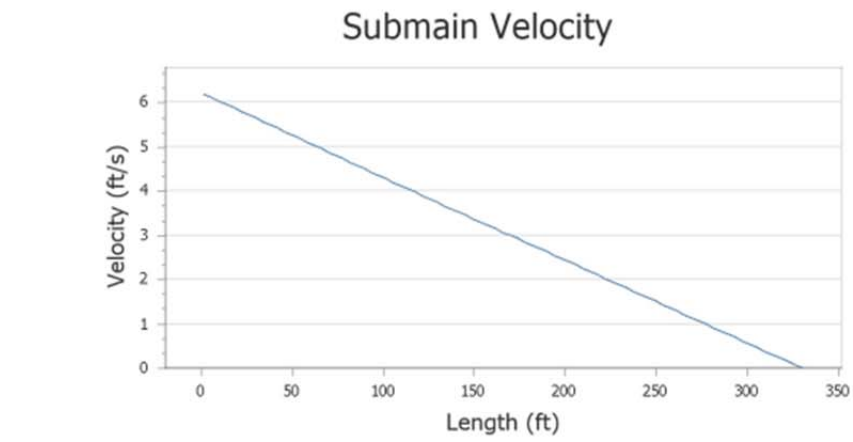

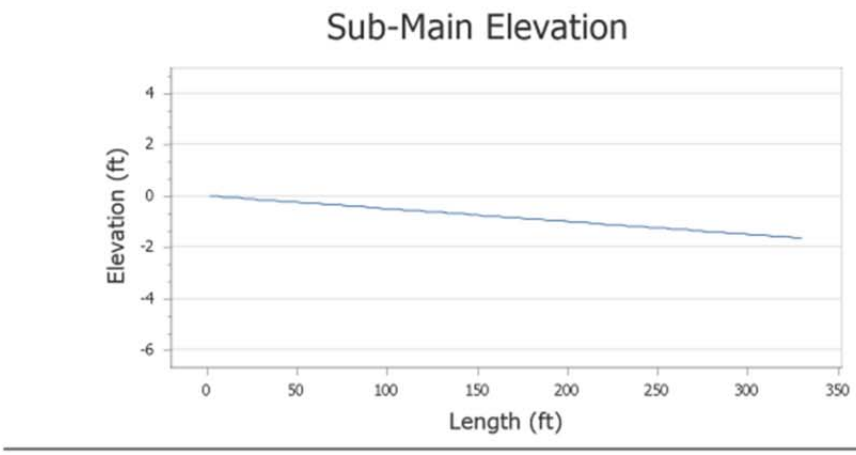

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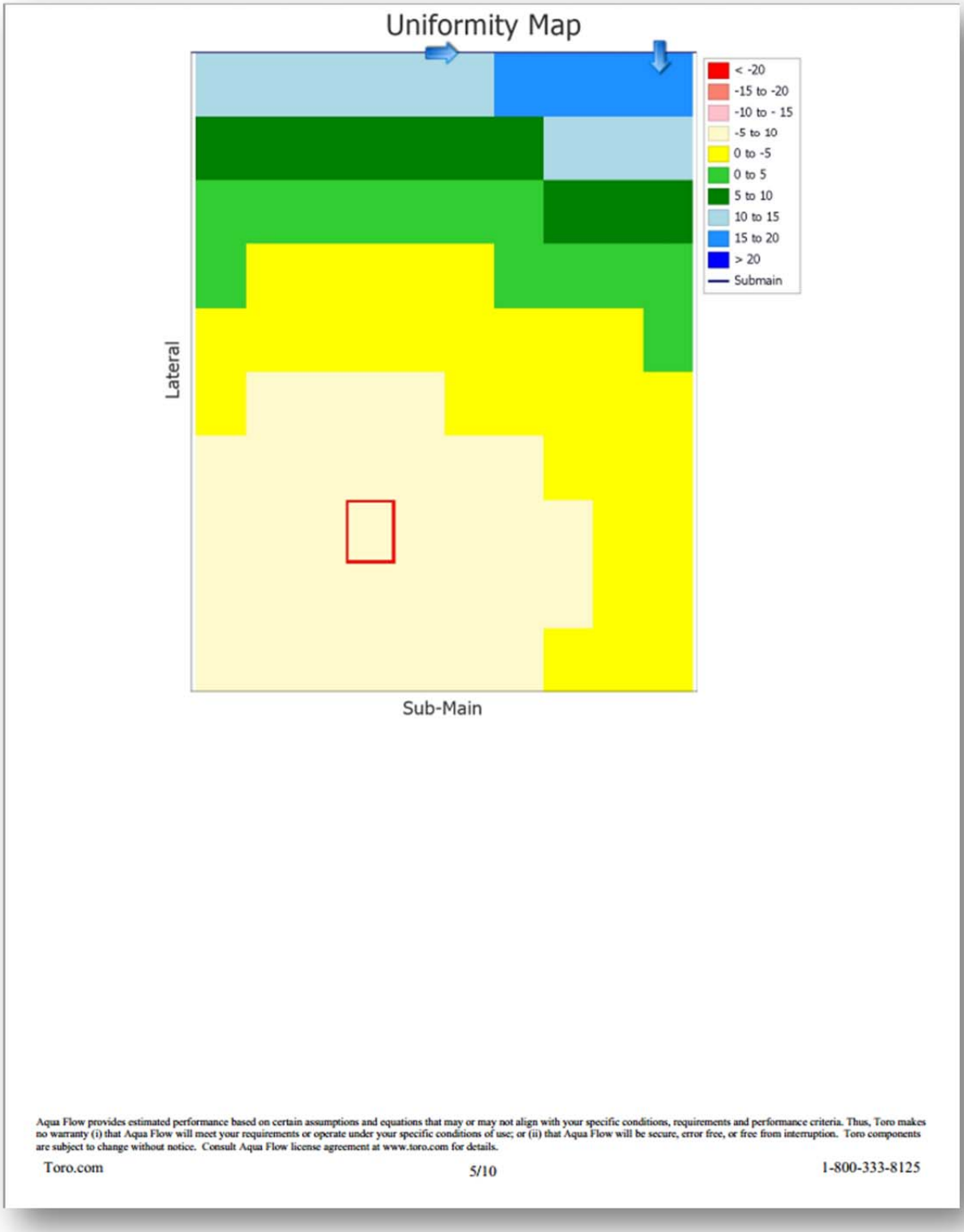

Aqua Flow provides estimated performance based on certain assumptions and equations that may or may not align with your specific conditions, requirements and performance criteria. Thus, Toro makes no warranty (i) that Aqua Flow will meet your requirements or operate under your specific conditions of use; or (ii) that Aqua Flow will be secure, error free, or free from interruption. Toro components are subject to change without notice. Consult Aqua Flow license agreement at www.toro.com for details.

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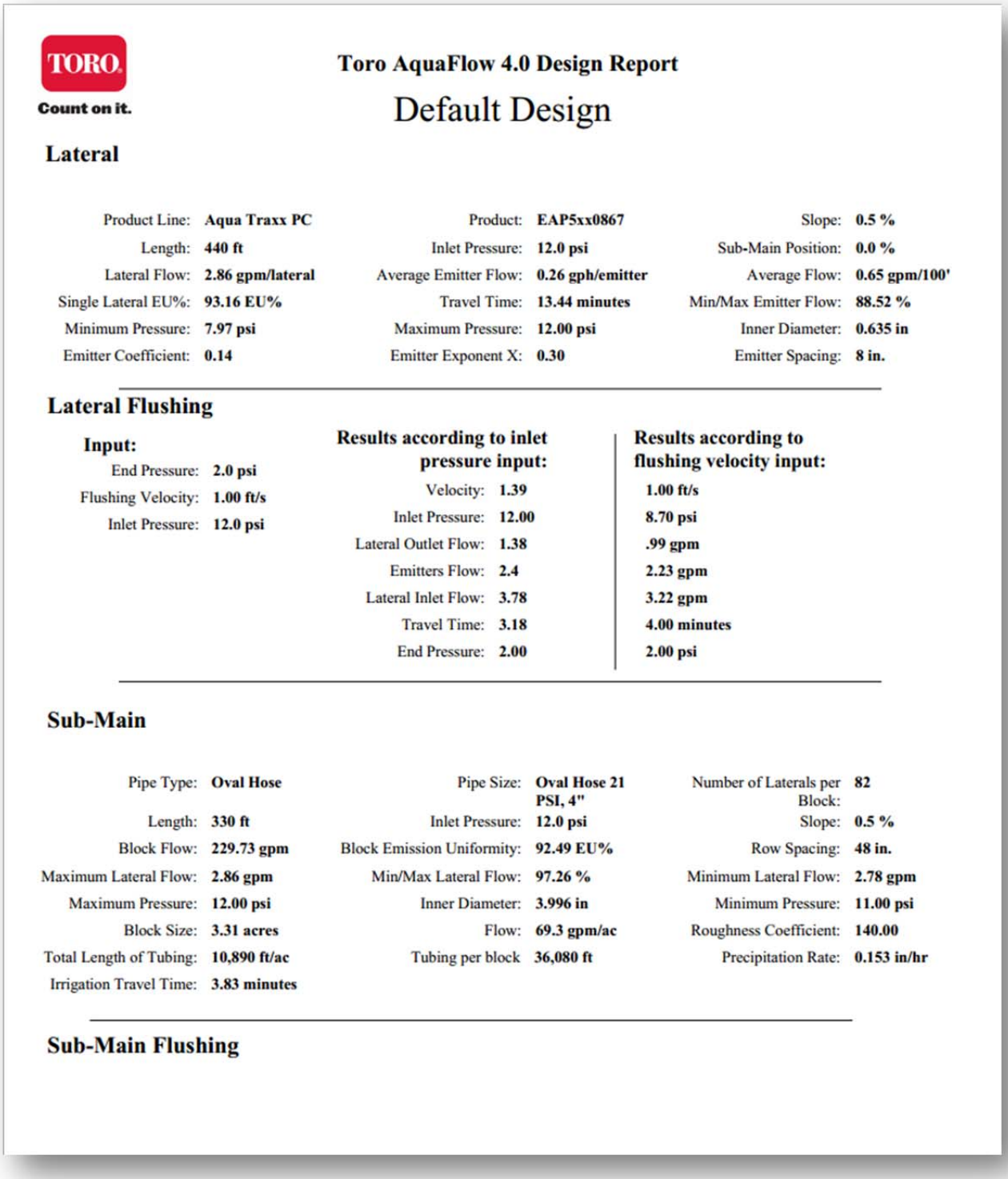


TORO
Count on it.

Toro AquaFlow 4.0 Design Report

Default Design

Lateral

Product Line:	**Aqua Traxx PC**	Product:	**EAP5xx0867**	Slope:	**0.5 %**
Length:	**440 ft**	Inlet Pressure:	**12.0 psi**	Sub-Main Position:	**0.0 %**
Lateral Flow:	**2.86 gpm/lateral**	Average Emitter Flow:	**0.26 gph/emitter**	Average Flow:	**0.65 gpm/100'**
Single Lateral EU%:	**93.16 EU%**	Travel Time:	**13.44 minutes**	Min/Max Emitter Flow:	**88.52 %**
Minimum Pressure:	**7.97 psi**	Maximum Pressure:	**12.00 psi**	Inner Diameter:	**0.635 in**
Emitter Coefficient:	**0.14**	Emitter Exponent X:	**0.30**	Emitter Spacing:	**8 in.**

Lateral Flushing

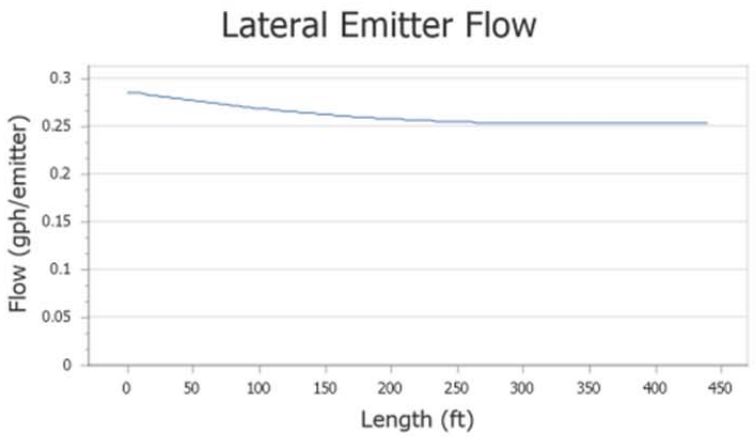
Input:		**Results according to inlet pressure input:**		**Results according to flushing velocity input:**
End Pressure:	**2.0 psi**	Velocity:	**1.39**	**1.00 ft/s**
Flushing Velocity:	**1.00 ft/s**	Inlet Pressure:	**12.00**	**8.70 psi**
Inlet Pressure:	**12.0 psi**	Lateral Outlet Flow:	**1.38**	**.99 gpm**
		Emitters Flow:	**2.4**	**2.23 gpm**
		Lateral Inlet Flow:	**3.78**	**3.22 gpm**
		Travel Time:	**3.18**	**4.00 minutes**
		End Pressure:	**2.00**	**2.00 psi**

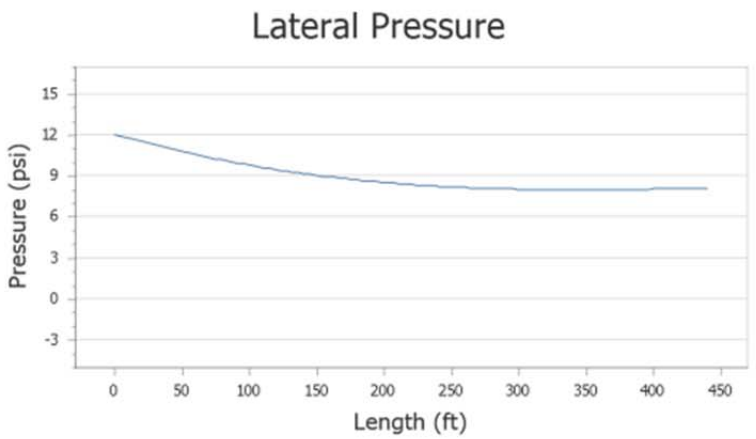
Sub-Main

Pipe Type:	**Oval Hose**	Pipe Size:	**Oval Hose 21 PSI, 4"**	Number of Laterals per Block:	**82**
Length:	**330 ft**	Inlet Pressure:	**12.0 psi**	Slope:	**0.5 %**
Block Flow:	**229.73 gpm**	Block Emission Uniformity:	**92.49 EU%**	Row Spacing:	**48 in.**
Maximum Lateral Flow:	**2.86 gpm**	Min/Max Lateral Flow:	**97.26 %**	Minimum Lateral Flow:	**2.78 gpm**
Maximum Pressure:	**12.00 psi**	Inner Diameter:	**3.996 in**	Minimum Pressure:	**11.00 psi**
Block Size:	**3.31 acres**	Flow:	**69.3 gpm/ac**	Roughness Coefficient:	**140.00**
Total Length of Tubing:	**10,890 ft/ac**	Tubing per block	**36,080 ft**	Precipitation Rate:	**0.153 in/hr**
Irrigation Travel Time:	**3.83 minutes**				

Sub-Main Flushing

Input:		**Results according to inlet pressure input:**		**Results according to flushing velocity input:**
End Pressure:	**2.0 psi**	Velocity:	**5.30**	**1.00 ft/s**
Flushing Velocity:	**1.00 ft/s**	Inlet Pressure:	**8.00**	**2.40 psi**
Inlet Pressure:	**8.0 psi**	Sub-Main Outlet Flow:	**207.15**	**39.09 gpm**
		Laterals Flow:	**168.4**	**131.88 gpm**
		Sub-Main Inlet Flow:	**375.55**	**170.97 gpm**
		Travel Time:	**0.78**	**2.41 minutes**
		End Pressure:	**2.00**	**2.00 psi**





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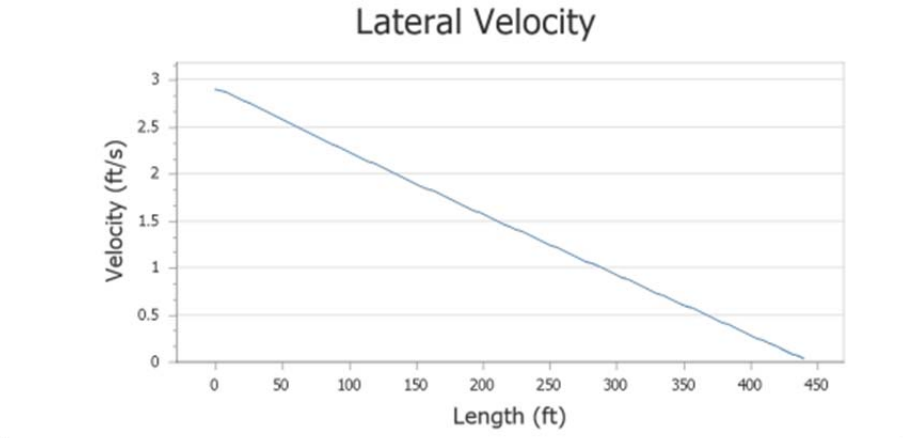

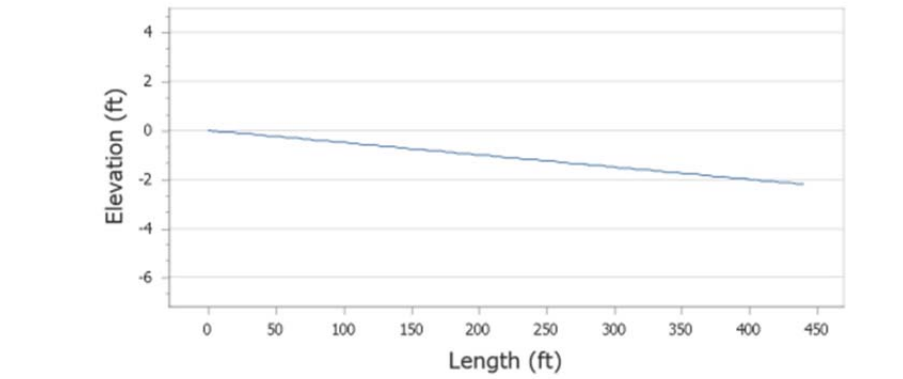

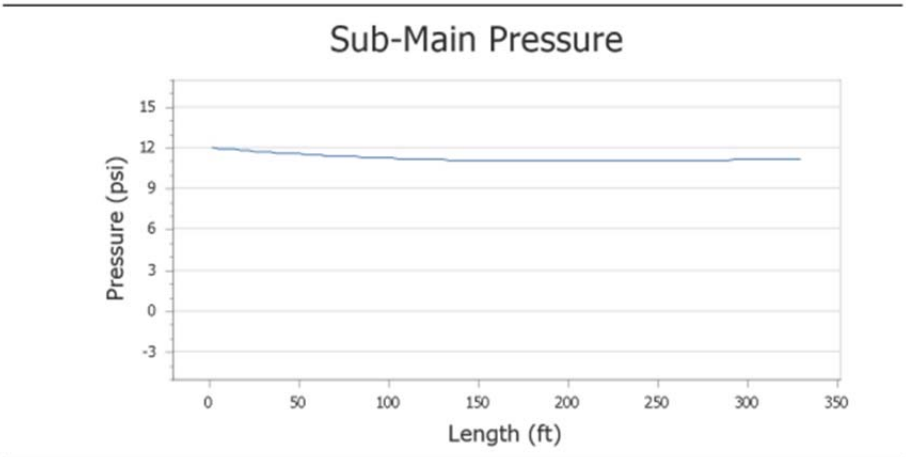

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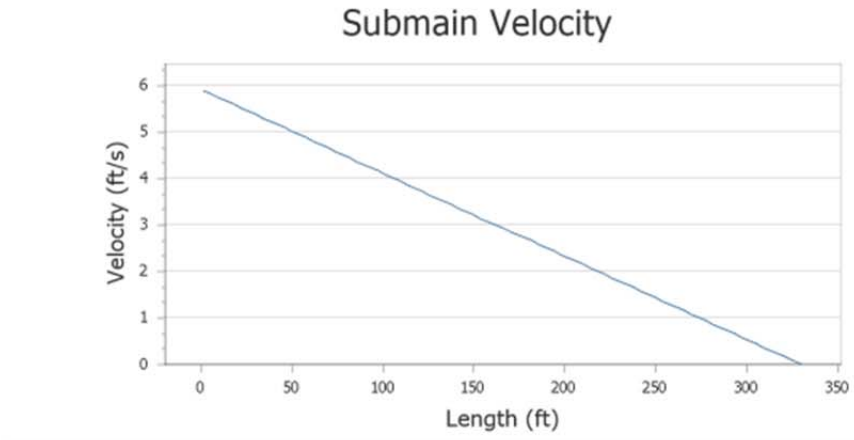

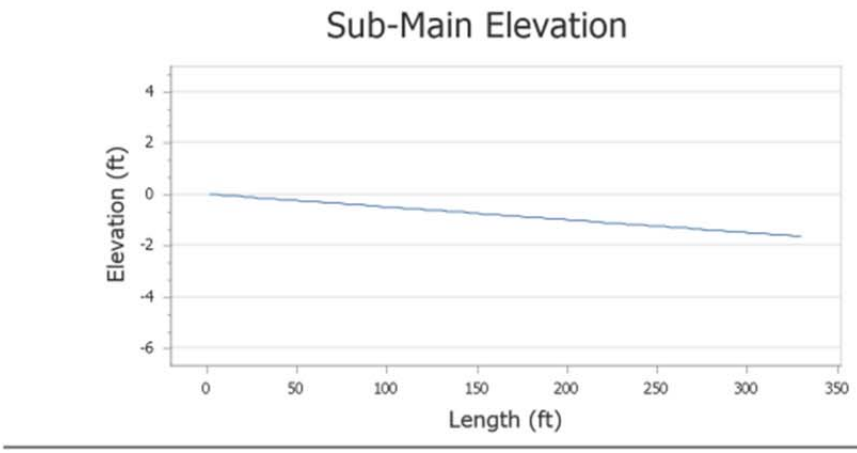

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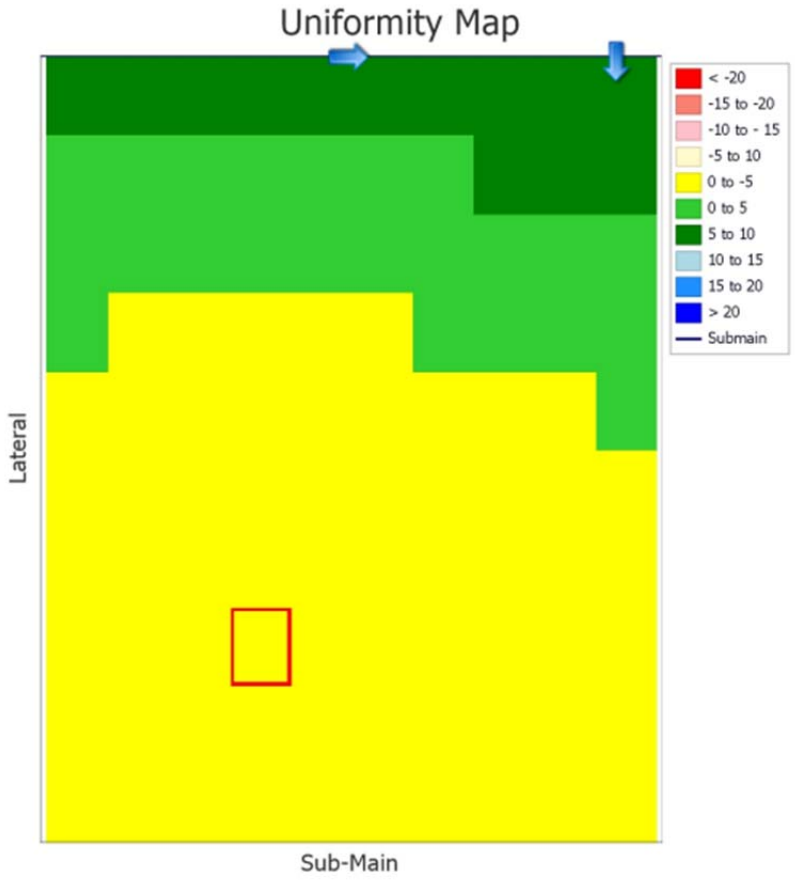

Conclusion

Thank you for your interest in AquaFlow. We know that making the right choices in drip irrigation design can be challenging. We believe that AquaFlow will help designers make better decisions to optimize the investment in drip irrigation.

For more information about Toro's products and services, visit our website at toro.com. For more information about drip irrigation best practices, "how-to" guides, or case studies, visit our educational website and blog at driptips.toro.com.