

## Priority Topic Area: Food and Drink

### 1 – Aim/planned deliverables – Fostering Engineering Education

The Strathclyde Community Garden Project is a process design project that addresses the gap between theoretical engineering education and the practical application of sustainable, low-cost technologies. By transforming an underutilized campus site into a permanent, community hub, the project provides a platform for students to engage with real-world challenges. The primary deliverables include:

- 5 plant beds (2.5m x 0.5m x 0.5m) growing oranges, lemons, raspberries, tomatoes and orchids
- A fully automated fertigation system that integrates precision irrigation with nutrient dosing
- An automated process control system

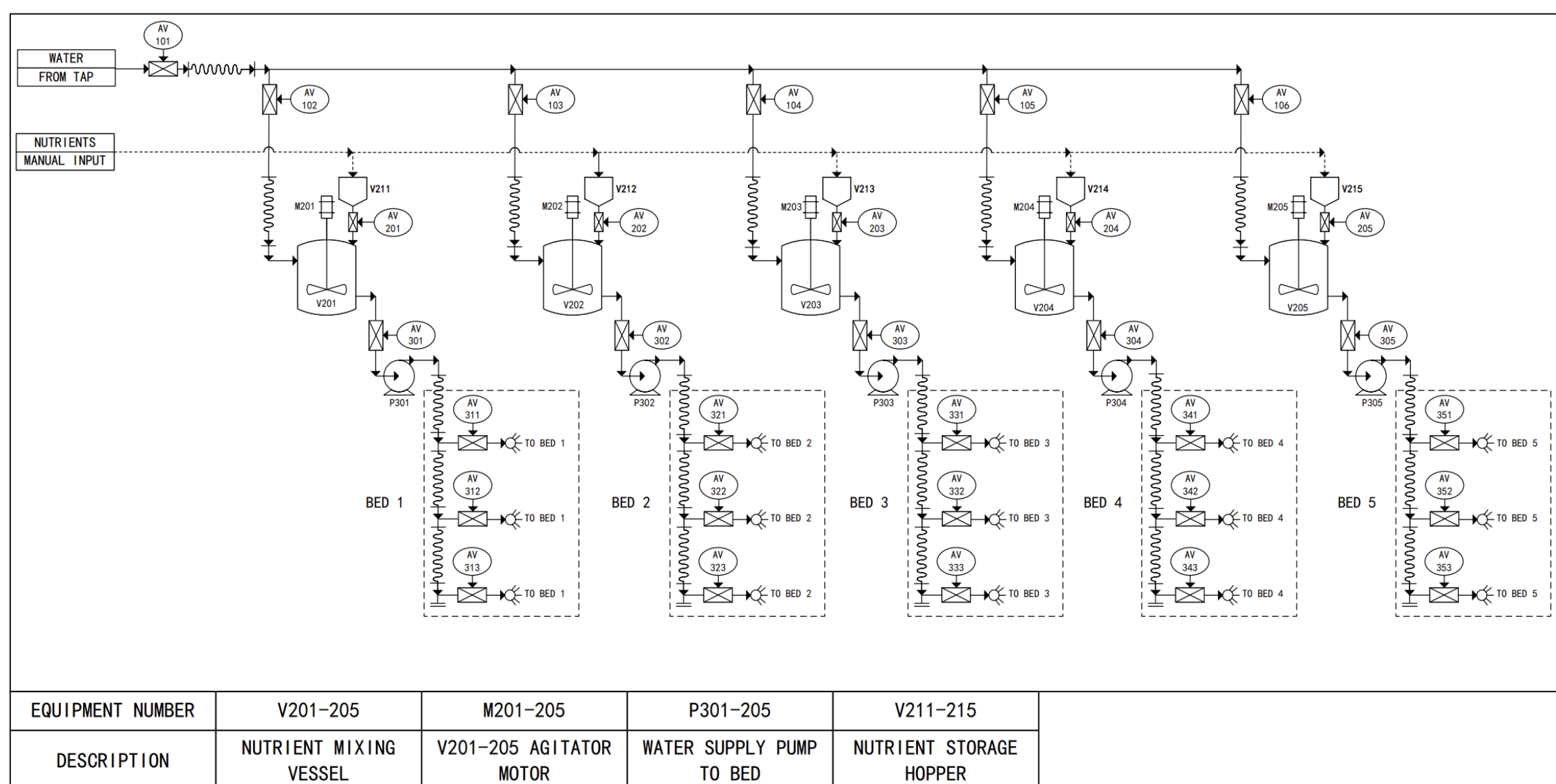


Figure 2: Process flow diagram for the automated fertigation system

### 3 – Outputs/Results/findings – Creative Problem Solving

The structured design methodology incorporated our knowledge of process design from both industrial experience in front end engineering design and from previous academic design projects. By using this method, We developed a detailed understanding of the mass balance of water and nutrients in each plant bed and soil type and were able to design an automated process control system for the fertigation each bed based on the requirements of each plant.

The growth of both oranges and lemons forced us to develop our creative problem solving, as the temperature is too low in Glasgow to grow these fruits year-round – this led to the development of curved greenhouses made from recycled bottles with integrated heating.

Beyond the technical infrastructure, the project prioritizes community-led education and resource circularity. We have successfully hosted student workshops, as shown in **Figure 3**, utilizing the garden site to inspire future engineers through hands-on demonstrations of sustainable technology. Furthermore, the project creates a closed-loop system within the university ecosystem; the fresh, sustainable produce harvested from the garden is planned to be integrated directly into the campus kitchen. Ultimately, this collaborative approach integrates technical excellence with social benefit, creating a public-facing hub for sustainable urban agriculture on campus.

### 4 – Benefit to society

This project advances urban sustainability by using underutilized campus spaces for education and innovation. By integrating automated fertigation, the garden will demonstrate how engineering can maximize local food security with minimal waste and provides students with essential hands-on experience in sustainable technology. Ultimately, the Strathclyde Smart Garden serves as a scalable model for community-led environmental stewardship, promoting the UN Sustainable Development Goals through visible innovation and collaborative learning.

Ultimately, the project aligns with UN Sustainable Development Goals 4, 11 and 12 by fostering quality education, providing sustainable food sources and developing urban technology.

### References/Acknowledgements

Thanks to the RS Group for providing funding for the Project

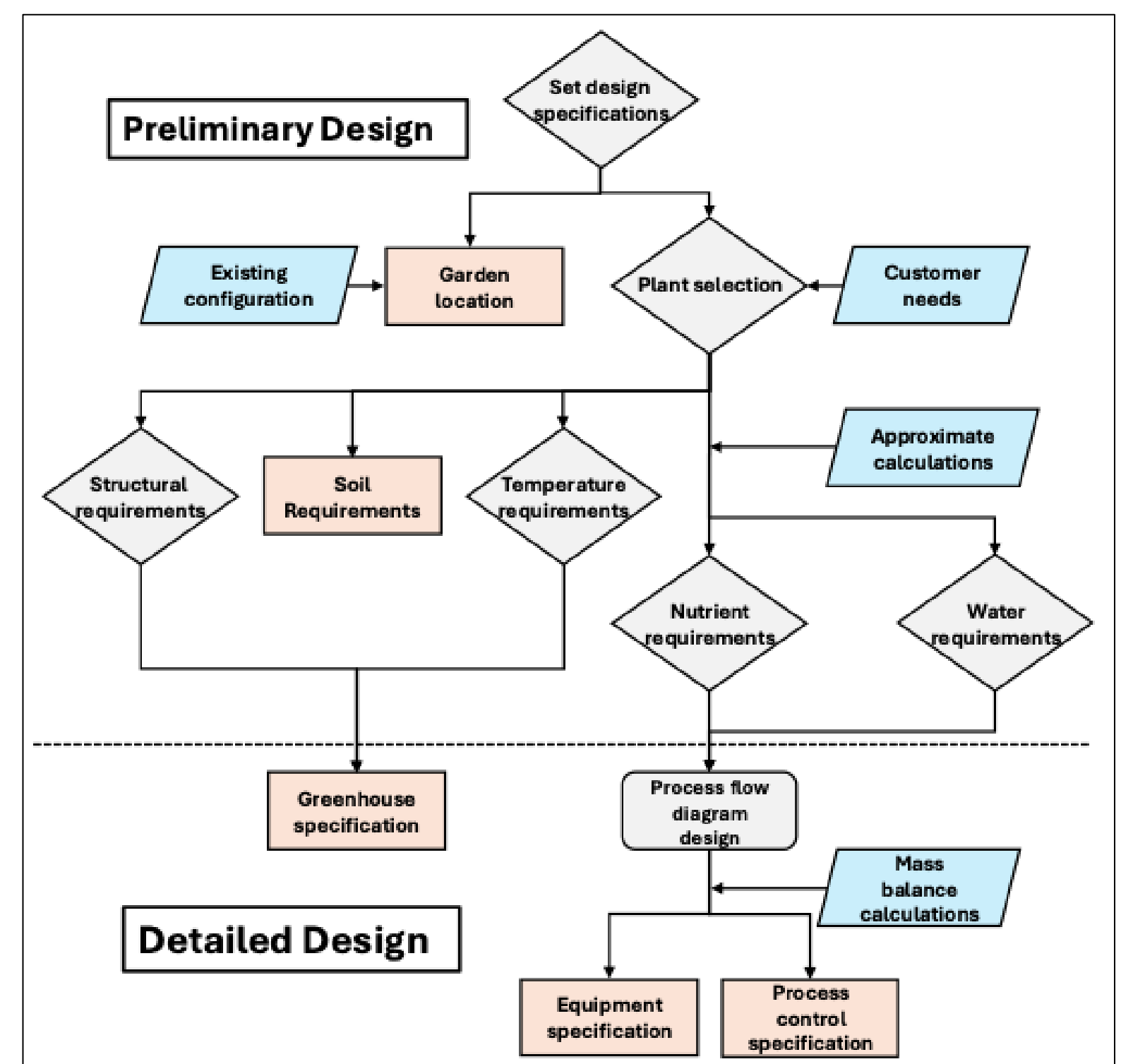


Figure 1: Design philosophy for the Community Garden Project

### 2 – Methodology – Structured Design Philosophy

The process design followed a structured design philosophy which followed the flowchart in **Figure 1** and was divided into preliminary and detailed design. The preliminary design phase involved selecting plants and determining their structural, soil, temperature, nutrient, and water needs through calculations and meetings held with the wider student community to discuss the customer needs relevant to the project.

The detailed design phase included the development of the Process Flow Diagram (PFD) shown in **Figure 2** and mass balance calculations to establish equipment and process control specifications for each bed. Additionally, temperature and structural requirements dictated the final greenhouse specifications.



Figure 3: Student Led Workshops

### 5 – Next Steps

Our next goal is to turn the garden into a student-led "living lab." We're inviting students to take over new design-and-build projects to improve the site's infrastructure and finish the automated fertigation system. By hosting technical Designathons and workshops, we'll make the garden a hands-on hub for real-world engineering.