Appendix 4

The appendix illustrates the trade-off between each pair of objectives in the P3 problem formulation.

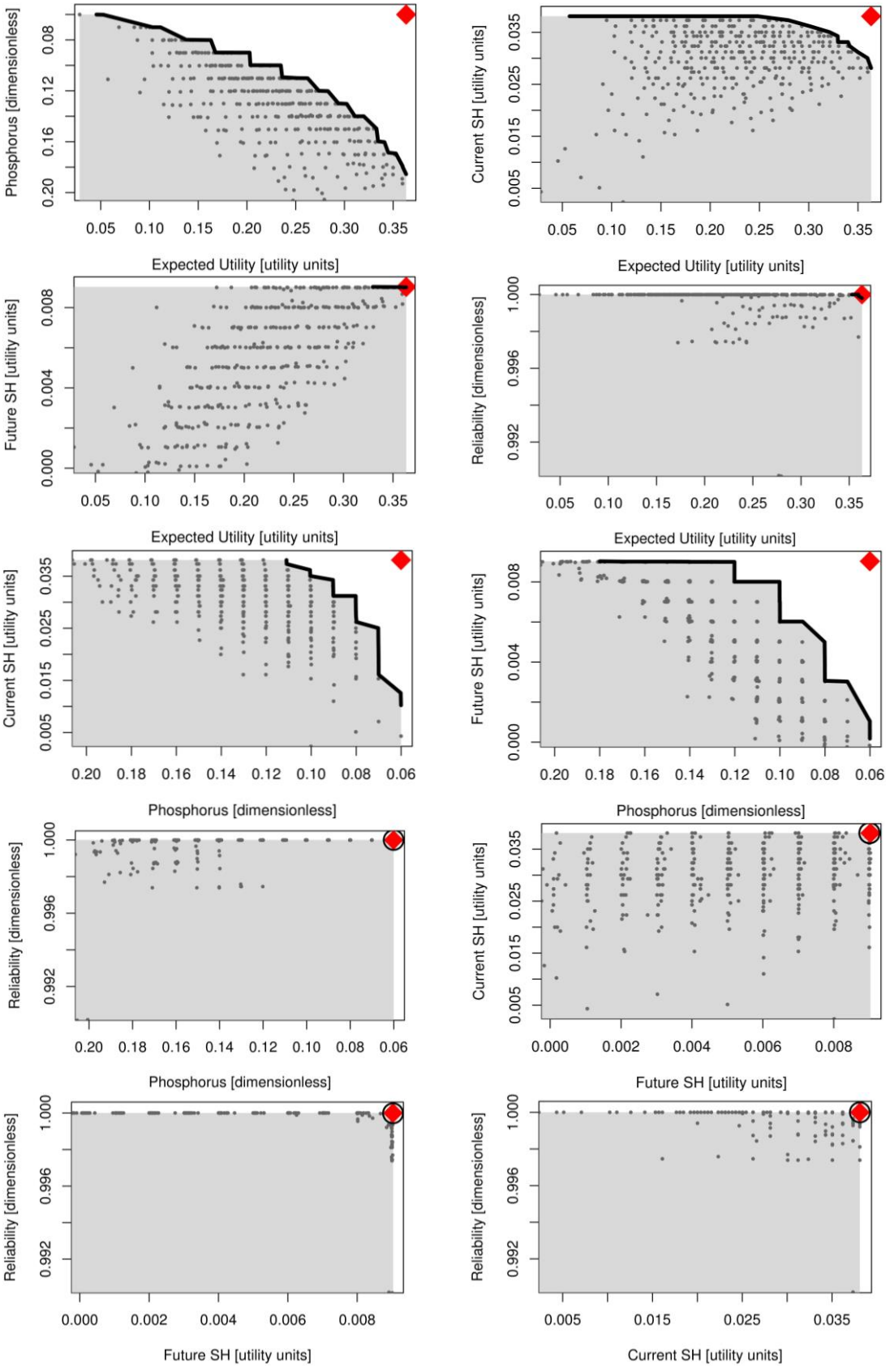

Figure A4.1 Trade-offs between each pair of objectives for the five-objective formulation P3. The objectives are – phosphorus in the lake (minimize), expected utility (maximize), expected utility of the present generation (maximize), expected utility of the future generations (maximize), and reliability (maximize). The 399 solutions from the five objective optimization are plotted as gray points. Nondominated sorting is carried out for each pair of objectives across the 399 points to identify the Pareto approximate front for each pair of objectives. The red diamond represents the ideal point. If there is tension between the two objectives, a front is identified and plotted as the black line. If there is no tension between two objectives, it implies that both can be simultaneously optimized and the ideal point is attainable, shown by the black circle around the red diamond. Gray shading represents the dominated region; solutions in this region are inferior to those at the Pareto approximate front. Note that all 399 solutions are nondominated w.r.t. each other in the five-dimensional objective space, but when the space is collapsed to two dimensions, the nondominated sorting is carried out again to identify the new Pareto front for two objectives.