

## Phase 7 Model Load Sensitivities to N and P Inputs – Request for Input

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The modeling team will be revisiting load sensitivities to inputs for Phase 7. While the Modeling WG is responsible for final approval of sensitivities we are seeking input from all WGs on their subject matter expertise.

Sensitivity (S) is defined as the change in export load per change in input load. If inputs change by  $\Delta$ , the export will change by  $S \cdot \Delta$  ( $S = \Delta \text{ Export} / \Delta \text{ Input}$ ).

- Where do sensitivities need to be looked at?
- What is the best path forward for updating sensitivities – E.g., a lit review, modeling?
- Are you aware of any good data or models that we should be looking into?

The lack of sensitivities for P in urban land uses has been identified as a potential issue. There are only P sensitivities to fertilizer inputs and these inputs for P are generally low. What about soil P? How about additional sources, e.g., grey infrastructure, SSOs, exfiltration.

For reference:

Table: Phase 6 developed land-use sensitivities

Load Source	Major Nutrient	Nutrient Species	Input Type	Sensitivity
Non-Regulated Roads	TN	NH3	AtmDep	0.1961
Non-Regulated Roads	TN	OrgN	AtmDep	0.4286
Non-Regulated Roads	TP	TP	Fert	0.2019
Non-Regulated Buildings and Other	TN	NH3	AtmDep	0.1579
Non-Regulated Buildings and Other	TN	OrgN	AtmDep	0.3453
Non-Regulated Buildings and Other	TP	TP	Fert	0.1679
Non-Regulated Turf Grass	TN	NH3	Uptake	0.0007
Non-Regulated Turf Grass	TN	NO3	Uptake	0.0003
Non-Regulated Turf Grass	TN	OrgN	Uptake	0.0002
Non-Regulated Turf Grass	TN	NH3	AtmDep	0.004
Non-Regulated Turf Grass	TN	NH3	CropCov	-0.0027
Non-Regulated Turf Grass	TN	NH3	Fert	0.0054
Non-Regulated Turf Grass	TN	NO3	AtmDep	0.0809
Non-Regulated Turf Grass	TN	OrgN	Fert	0.0094
Non-Regulated Turf Grass	TN	NO3	CropCov	0.0007
Non-Regulated Turf Grass	TN	NO3	Fert	0.0337
Non-Regulated Turf Grass	TN	OrgN	AtmDep	0.0081

Non-Regulated Turf Grass	TN	OrgN	CropCov	-0.2548
Non-Regulated Turf Grass	TP	TP	Fert	0.2096
MS4 Tree Canopy over Turfgrass	TN	NH3	AtmDep	0.0028
MS4 Tree Canopy over Turfgrass	TN	NH3	CropCov	-0.0014
MS4 Tree Canopy over Turfgrass	TN	NH3	Fert	0.0042
MS4 Tree Canopy over Turfgrass	TN	NO3	AtmDep	0.0552
MS4 Tree Canopy over Turfgrass	TN	OrgN	Fert	0.0071
MS4 Tree Canopy over Turfgrass	TN	NO3	CropCov	0.0005
MS4 Tree Canopy over Turfgrass	TN	NO3	Fert	0.0236
MS4 Tree Canopy over Turfgrass	TN	OrgN	AtmDep	0.0057
MS4 Tree Canopy over Turfgrass	TN	OrgN	CropCov	-0.1747
MS4 Tree Canopy over Turfgrass	TN	NH3	Uptake	0.0006
MS4 Tree Canopy over Turfgrass	TN	NO3	Uptake	0.0002
MS4 Tree Canopy over Turfgrass	TN	OrgN	Uptake	0.0001
MS4 Tree Canopy over Turfgrass	TP	TP	Fert	0.1597
MS4 Turf Grass	TN	NH3	AtmDep	0.0037
MS4 Turf Grass	TN	NH3	CropCov	-0.0019
MS4 Turf Grass	TN	NH3	Fert	0.0056
MS4 Turf Grass	TN	NO3	AtmDep	0.0725
MS4 Turf Grass	TN	OrgN	Fert	0.0093
MS4 Turf Grass	TN	NO3	CropCov	0.0006
MS4 Turf Grass	TN	NO3	Fert	0.031
MS4 Turf Grass	TN	OrgN	AtmDep	0.0074
MS4 Turf Grass	TN	OrgN	CropCov	-0.2293
MS4 Turf Grass	TN	NH3	Uptake	0.0007
MS4 Turf Grass	TN	NO3	Uptake	0.0003
MS4 Turf Grass	TN	OrgN	Uptake	0.0002
MS4 Turf Grass	TP	TP	Fert	0.2096
MS4 Tree Canopy over Impervious	TN	NH3	AtmDep	0.1356
MS4 Tree Canopy over Impervious	TN	OrgN	AtmDep	0.2914
MS4 Tree Canopy over Impervious	TP	TP	Fert	0.1828
MS4 Buildings and Other	TN	NH3	AtmDep	0.1196
MS4 Buildings and Other	TN	OrgN	AtmDep	0.2572
MS4 Buildings and Other	TP	TP	Fert	0.1679
MS4 Roads	TN	NH3	AtmDep	0.1513
MS4 Roads	TN	OrgN	AtmDep	0.3253
MS4 Roads	TP	TP	Fert	0.2096
MS4 Construction	TN	NH3	AtmDep	0.0089
MS4 Construction	TN	NH3	CropCov	-0.0045
MS4 Construction	TN	NH3	Fert	0.0134
MS4 Construction	TN	NH3	Uptake	0.0006
MS4 Construction	TN	OrgN	AtmDep	0.0178
MS4 Construction	TN	OrgN	CropCov	-0.5491

MS4 Construction	TN	OrgN	Fert	0.0223
MS4 Construction	TN	OrgN	Uptake	0.0001
MS4 Construction	TN	NO3	AtmDep	0.1736
MS4 Construction	TN	NO3	CropCov	0.0015
MS4 Construction	TN	NO3	Fert	0.0742
MS4 Construction	TN	NO3	Uptake	0.0003
MS4 Construction	TP	TP	Fert	0.785
Non-Regulated Tree Canopy over Turfgrass	TN	NH3	Uptake	0.0006
Non-Regulated Tree Canopy over Turfgrass	TN	NO3	Uptake	0.0002
Non-Regulated Tree Canopy over Turfgrass	TN	OrgN	Uptake	0.0001
Non-Regulated Tree Canopy over Turfgrass	TN	NH3	AtmDep	0.0031
Non-Regulated Tree Canopy over Turfgrass	TN	NH3	CropCov	-0.0021
Non-Regulated Tree Canopy over Turfgrass	TN	NH3	Fert	0.0041
Non-Regulated Tree Canopy over Turfgrass	TN	NO3	AtmDep	0.0616
Non-Regulated Tree Canopy over Turfgrass	TN	OrgN	Fert	0.0072
Non-Regulated Tree Canopy over Turfgrass	TN	NO3	CropCov	0.0005
Non-Regulated Tree Canopy over Turfgrass	TN	NO3	Fert	0.0257
Non-Regulated Tree Canopy over Turfgrass	TN	OrgN	AtmDep	0.0062
Non-Regulated Tree Canopy over Turfgrass	TN	OrgN	CropCov	-0.1942
Non-Regulated Tree Canopy over Turfgrass	TP	TP	Fert	0.1597
Non-Regulated Tree Canopy over Impervious	TN	NH3	AtmDep	0.179
Non-Regulated Tree Canopy over Impervious	TN	OrgN	AtmDep	0.3913
Non-Regulated Tree Canopy over Impervious	TP	TP	Fert	0.1828
CSS Tree Canopy over Turfgrass	TN	NH3	AtmDep	0.0028
CSS Tree Canopy over Turfgrass	TN	NH3	CropCov	-0.0014
CSS Tree Canopy over Turfgrass	TN	NH3	Fert	0.0042
CSS Tree Canopy over Turfgrass	TN	NH3	Uptake	0.0006
CSS Tree Canopy over Turfgrass	TN	NO3	AtmDep	0.0552
CSS Tree Canopy over Turfgrass	TN	NO3	CropCov	0.0005
CSS Tree Canopy over Turfgrass	TN	NO3	Fert	0.0236
CSS Tree Canopy over Turfgrass	TN	NO3	Uptake	0.0002
CSS Tree Canopy over Turfgrass	TN	OrgN	AtmDep	0.0057
CSS Tree Canopy over Turfgrass	TN	OrgN	CropCov	-0.1747
CSS Tree Canopy over Turfgrass	TN	OrgN	Fert	0.0071
CSS Tree Canopy over Turfgrass	TN	OrgN	Uptake	0.0001
CSS Tree Canopy over Turfgrass	TP	TP	Fert	0.1597
CSS Tree Canopy over Impervious	TN	NH3	AtmDep	0.1356
CSS Tree Canopy over Impervious	TN	OrgN	AtmDep	0.2914
CSS Tree Canopy over Impervious	TP	TP	Fert	0.1828
CSS Construction	TN	NH3	AtmDep	0.0089
CSS Construction	TN	NH3	CropCov	-0.0045
CSS Construction	TN	NH3	Fert	0.0134
CSS Construction	TN	NH3	Uptake	0.0006

CSS Construction	TN	NO3	AtmDep	0.1736
CSS Construction	TN	NO3	CropCov	0.0015
CSS Construction	TN	NO3	Fert	0.0742
CSS Construction	TN	NO3	Uptake	0.0003
CSS Construction	TN	OrgN	AtmDep	0.0178
CSS Construction	TN	OrgN	CropCov	-0.5491
CSS Construction	TN	OrgN	Fert	0.0223
CSS Construction	TN	OrgN	Uptake	0.0001
CSS Construction	TP	TP	Fert	0.785
CSS Roads	TN	NH3	AtmDep	0.1513
CSS Roads	TN	OrgN	AtmDep	0.3253
CSS Roads	TP	TP	Fert	0.2096
CSS Buildings and Other	TN	NH3	AtmDep	0.1196
CSS Buildings and Other	TN	OrgN	AtmDep	0.2572
CSS Buildings and Other	TP	TP	Fert	0.1679
CSS Turf Grass	TN	NH3	AtmDep	0.0037
CSS Turf Grass	TN	NH3	CropCov	-0.0019
CSS Turf Grass	TN	NH3	Fert	0.0056
CSS Turf Grass	TN	NH3	Uptake	0.0007
CSS Turf Grass	TN	NO3	AtmDep	0.0725
CSS Turf Grass	TN	NO3	CropCov	0.0006
CSS Turf Grass	TN	NO3	Fert	0.031
CSS Turf Grass	TN	NO3	Uptake	0.0003
CSS Turf Grass	TN	OrgN	AtmDep	0.0074
CSS Turf Grass	TN	OrgN	CropCov	-0.2293
CSS Turf Grass	TN	OrgN	Fert	0.0093
CSS Turf Grass	TN	OrgN	Uptake	0.0002
CSS Turf Grass	TP	TP	Fert	0.2096