Wisconsin DNR Best Management Practice Workgroup

Atmospheric Dispersion Modeling

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Air Dispersion Modeling

- Interaction of Emitted Gases with Air
- Considers only the Physical Interaction
  - No Chemical Modification or Formation
- The Concentration or Dilution of Effluent

Regulatory Dispersion Modeling

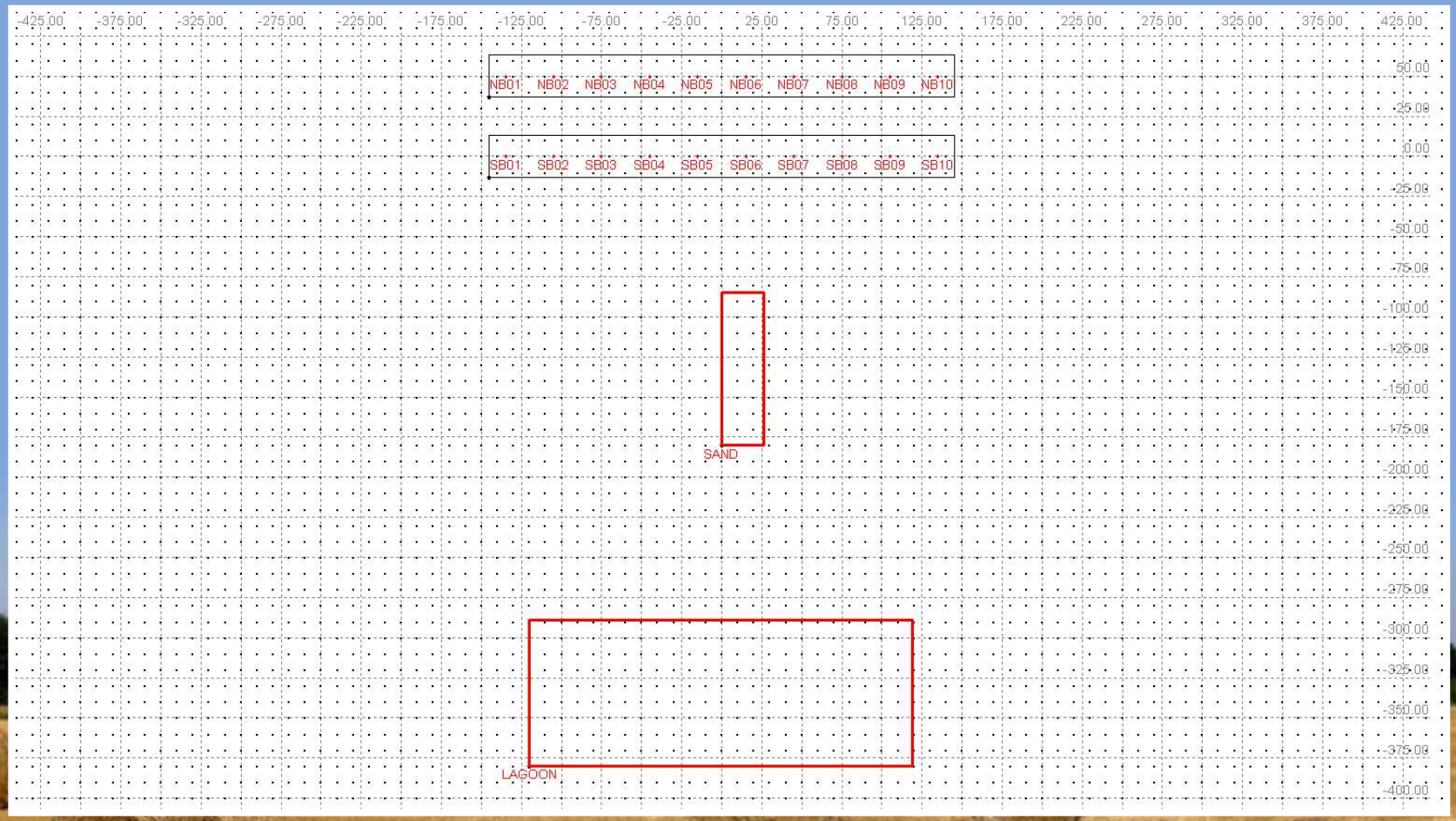
- Statistics Based
- Steady-State Emissions
- Consistent Application and Review
- Accuracy Dependent on Input Data

“Model” Farms

- Ammonia Emissions from Dairy Production in Wisconsin (Harper, et al)
- Farm 1 – Small; Farm 2 - Large
- Emissions from Barns, Sand Channels, & Waste Storage Lagoons

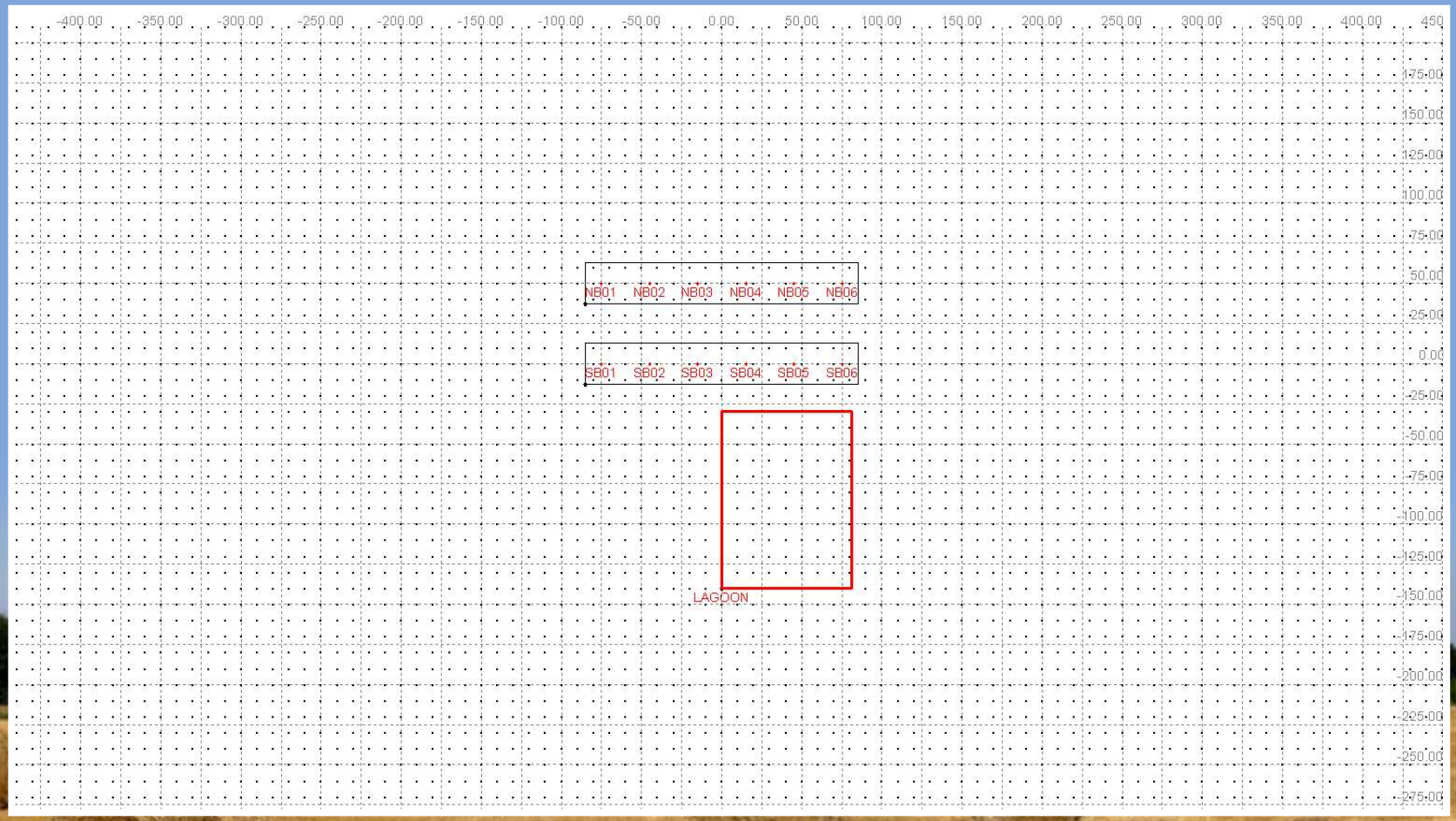
Large Farm

- Sources (Red); Receptors (Black)



Small Farm

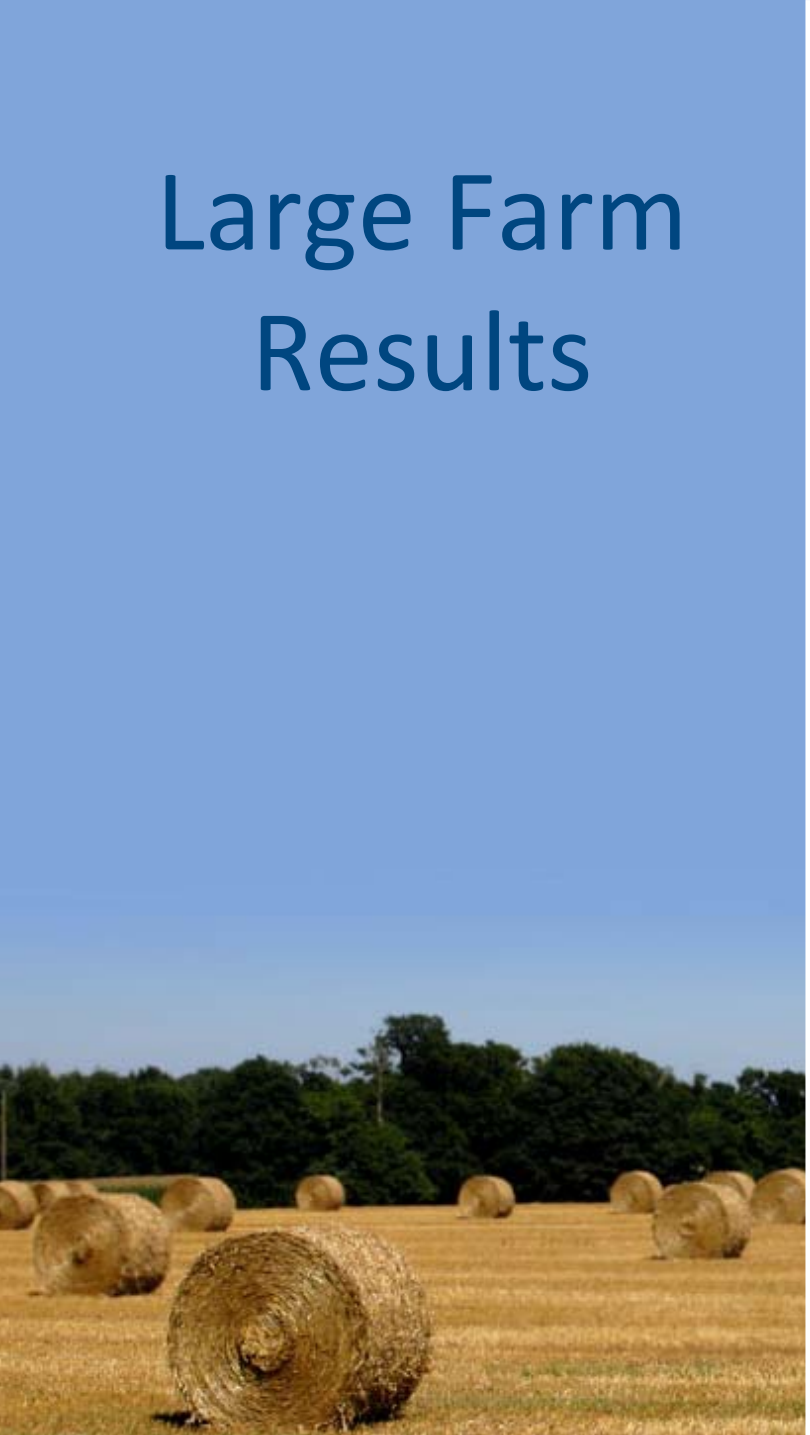
- Sources (Red); Receptors (Black)

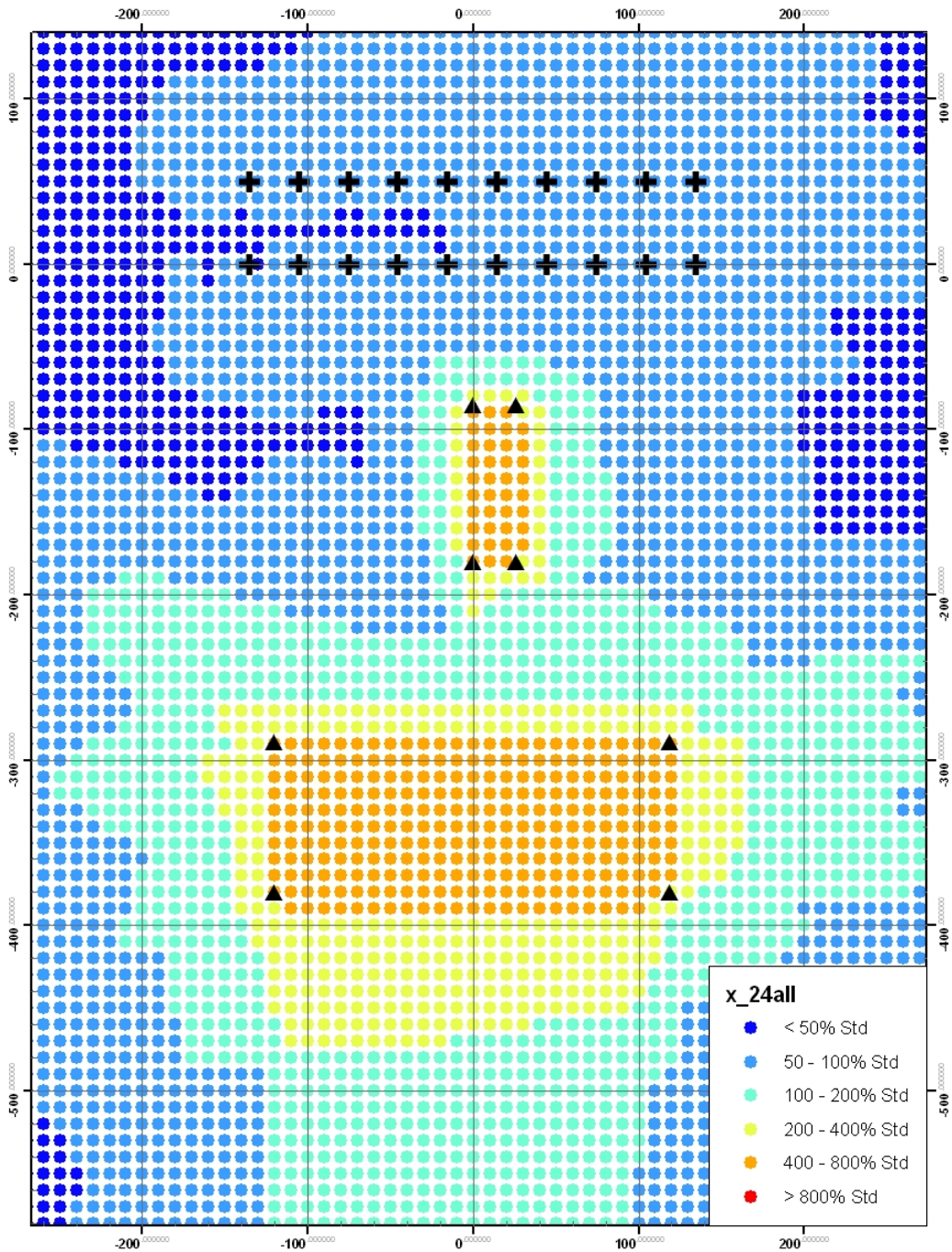


Types of Modeled Sources

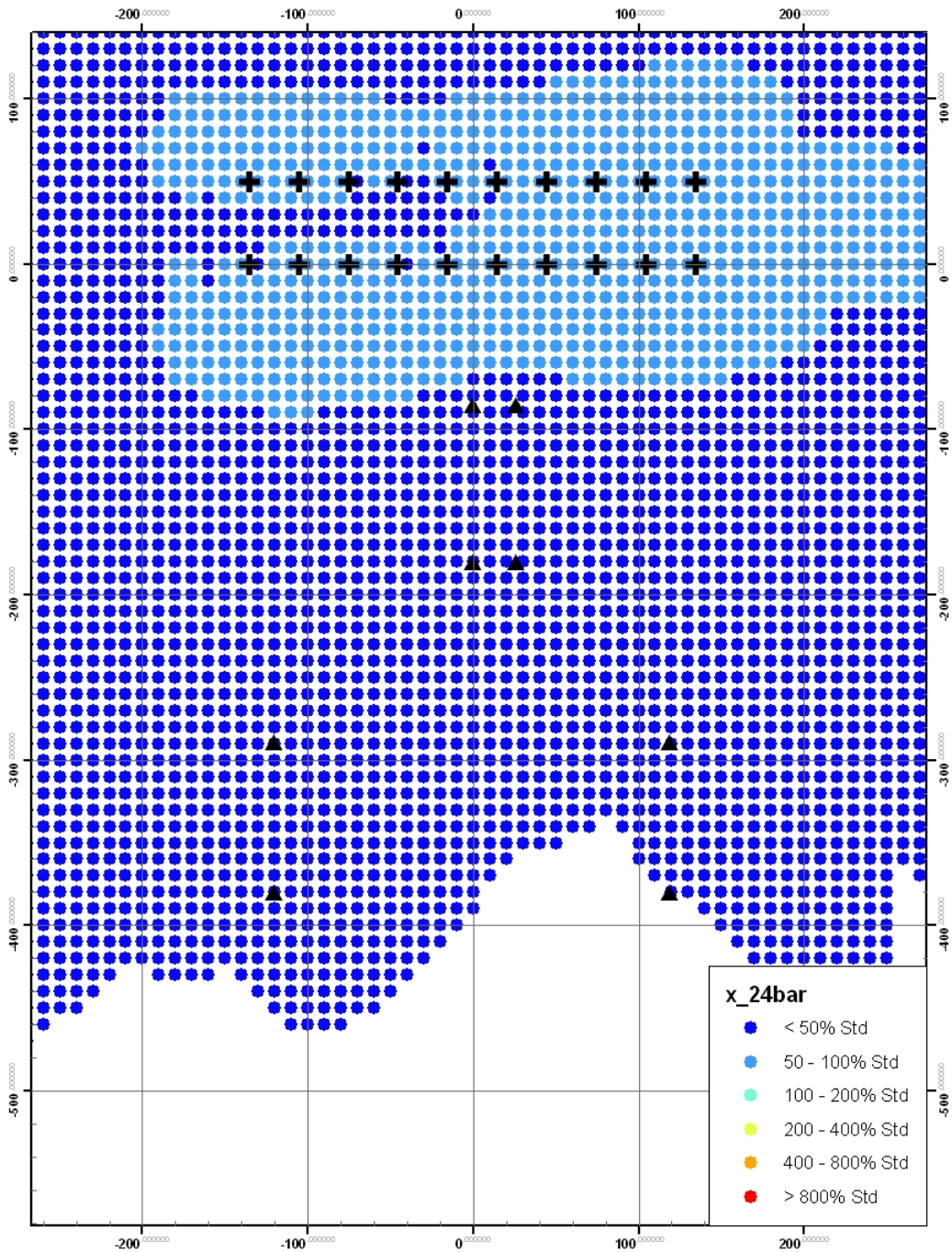
- Barn Emissions Represented by Volume Sources (Parcels of Air)
- Lagoon and Sand Channel Emissions Represented by Area Sources
- Both Types Modified by Month of Year, Lagoons also by Time of Day, Sand Channels by Wind Speed

Large Farm Results

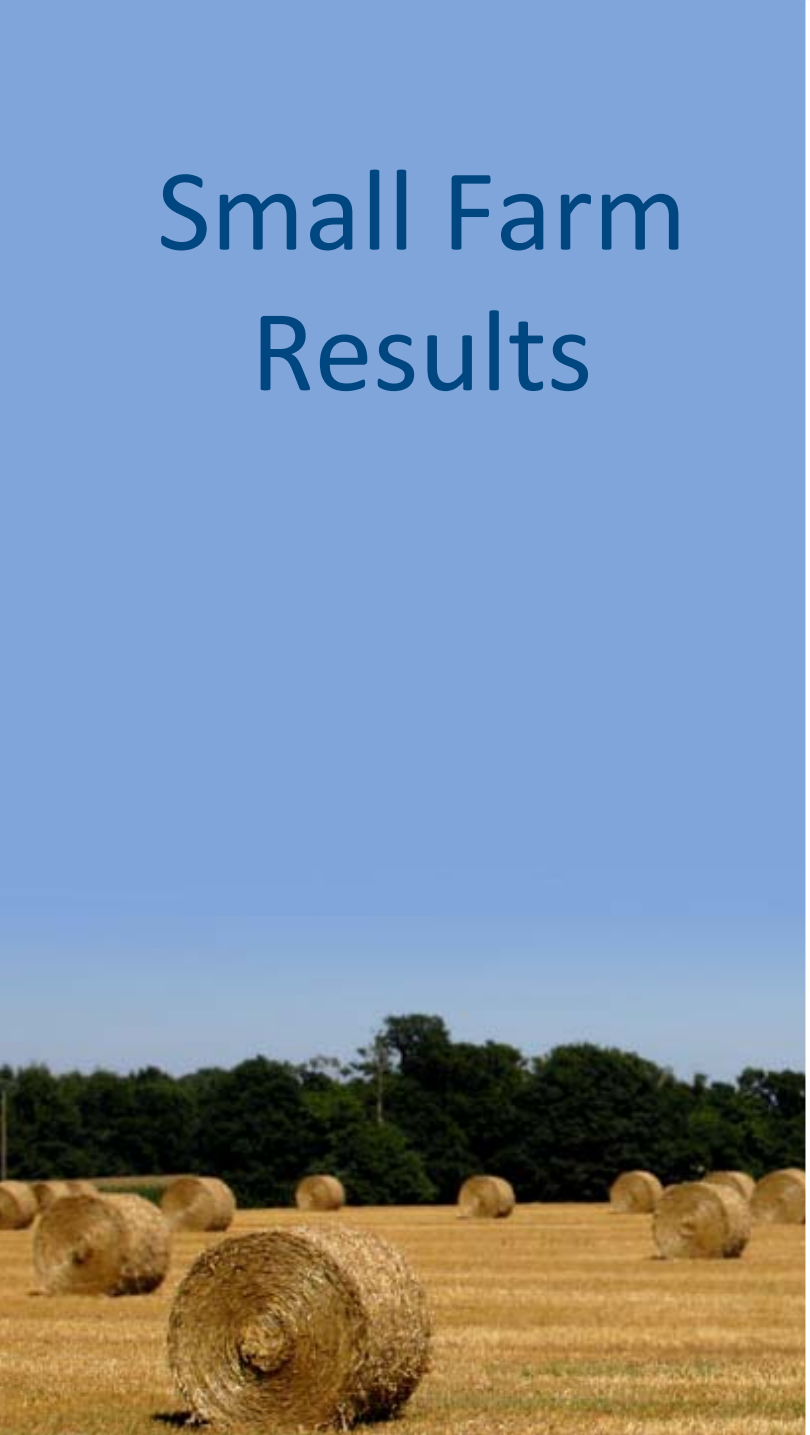


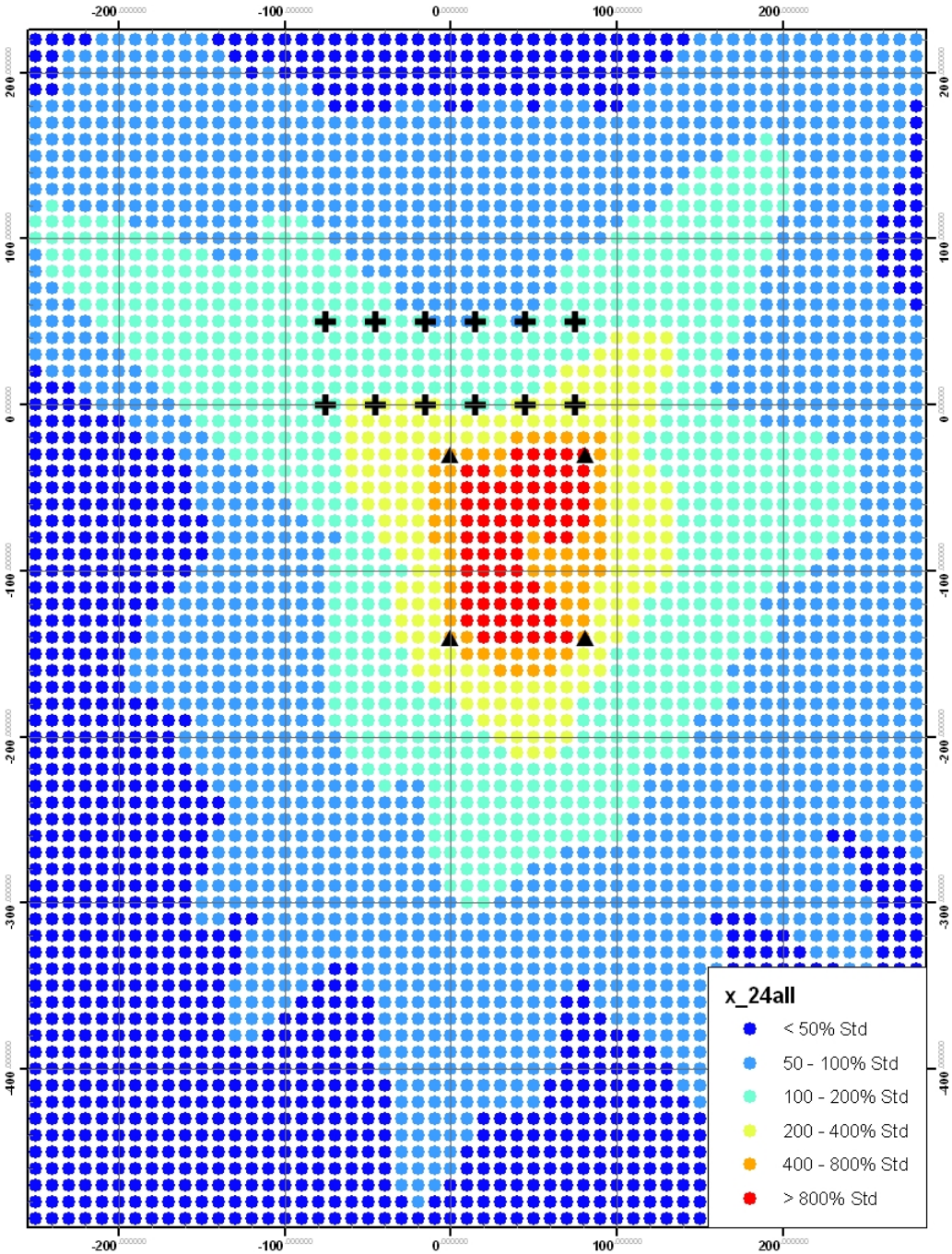


Large Farm Results Barn Only

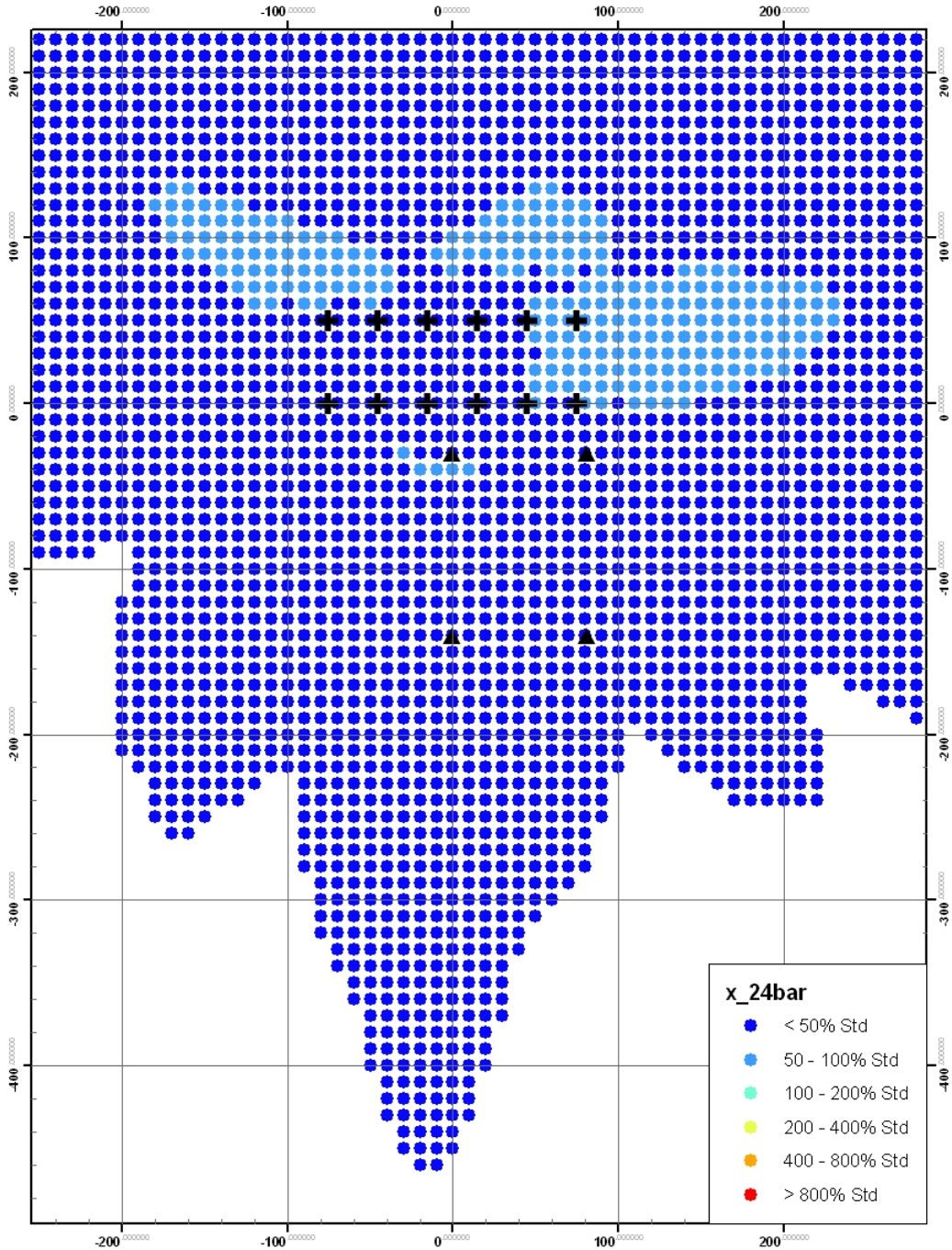


Small Farm Results

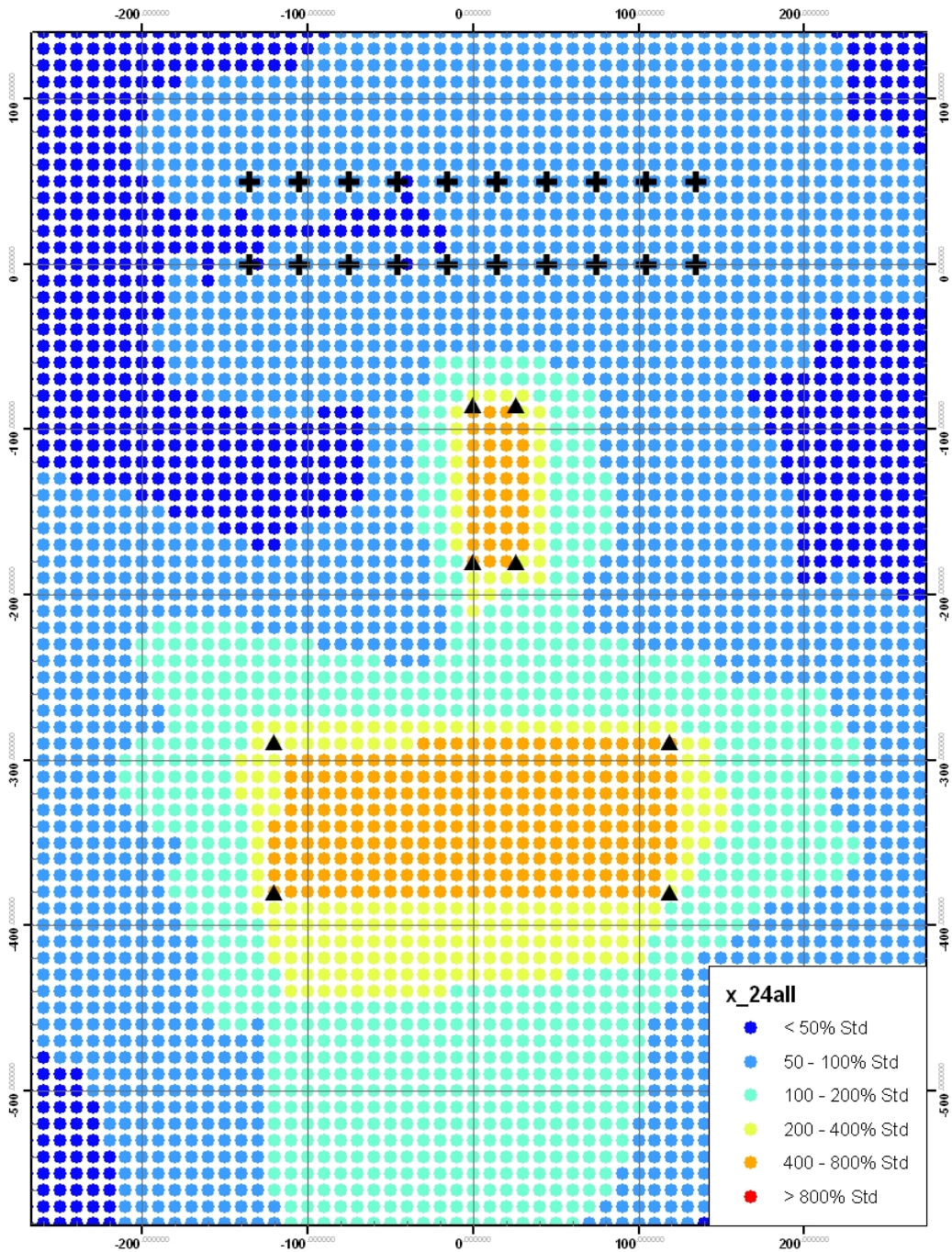




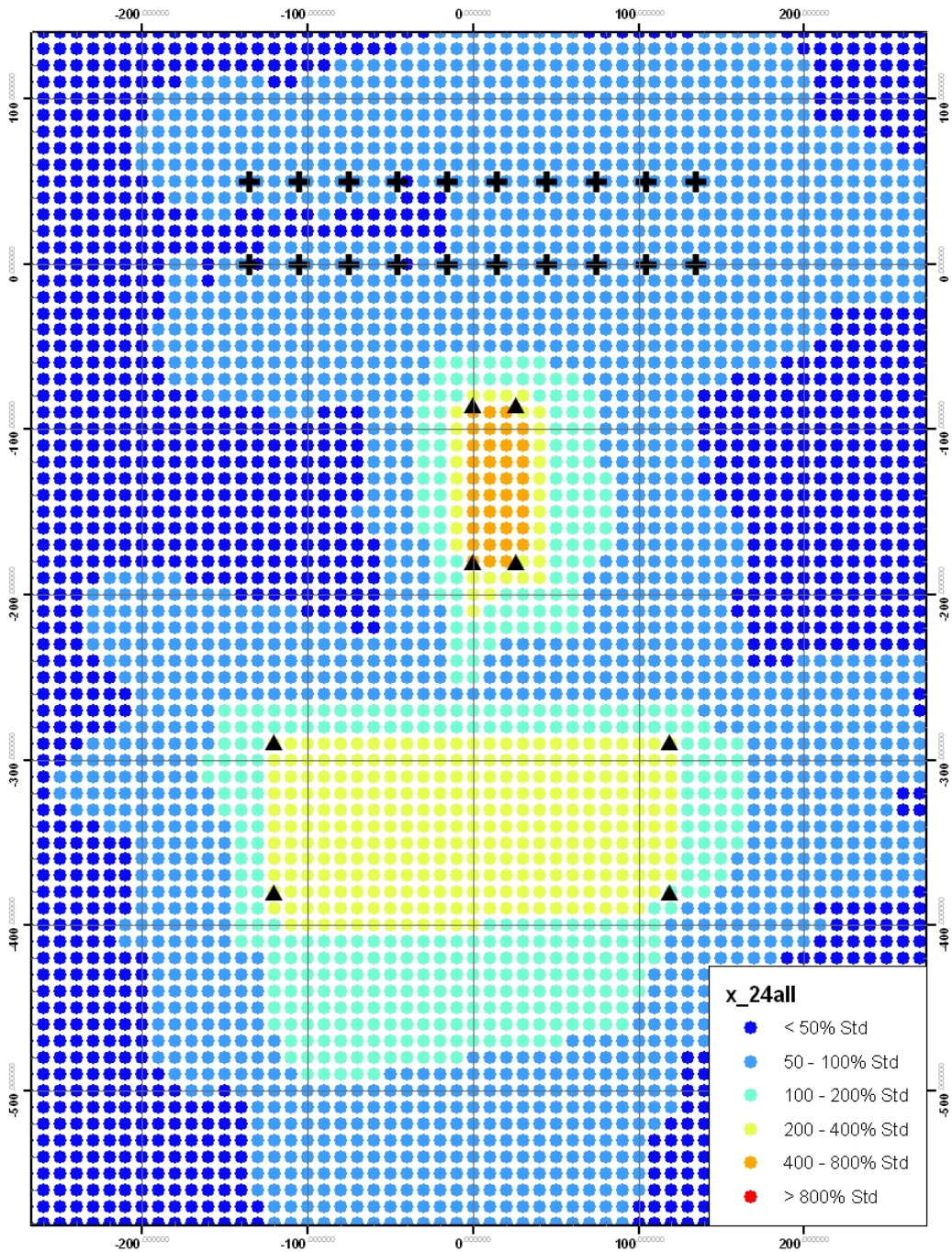
Small Farm Results Barn Only



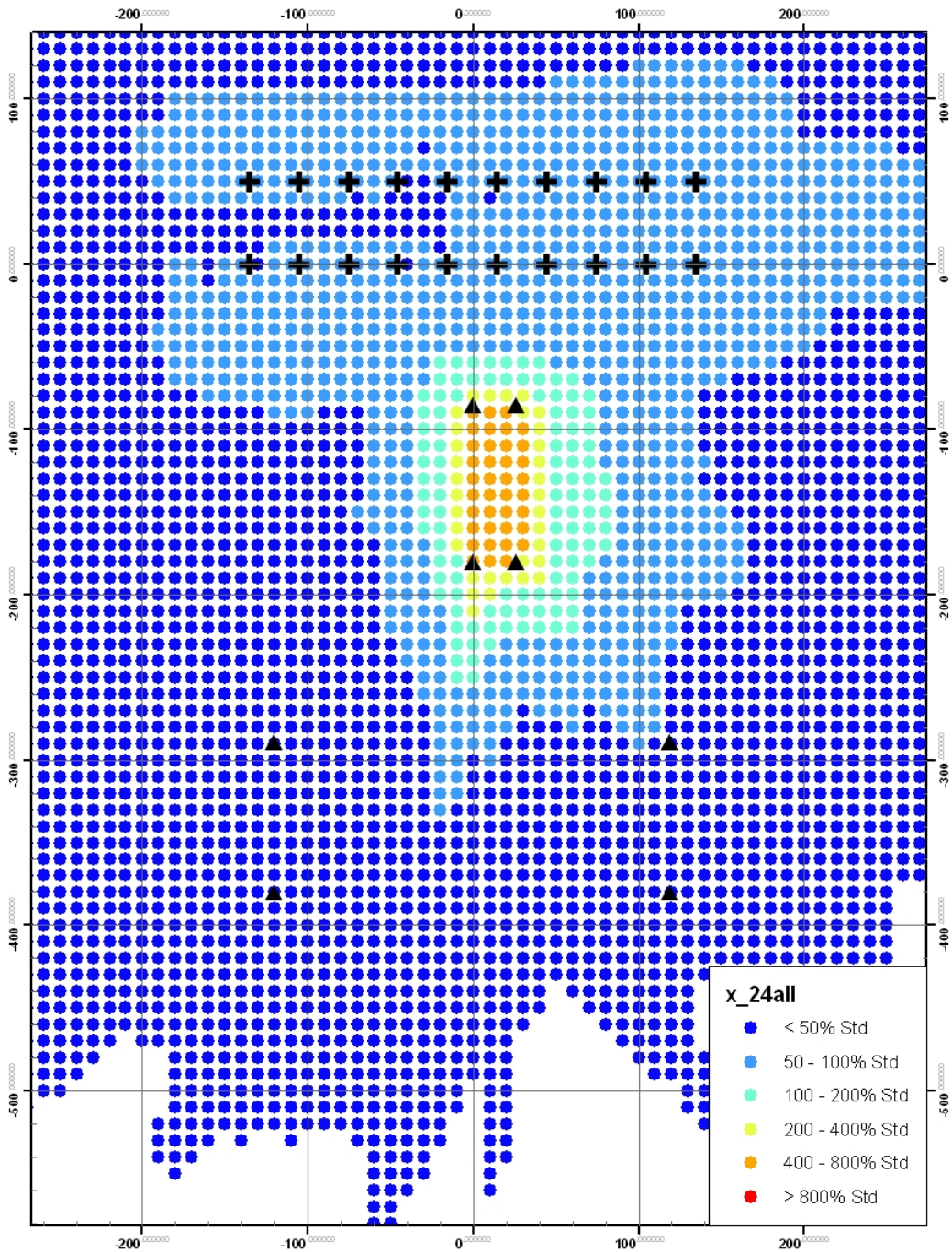
Large Farm Results Lagoon Reduced 20%



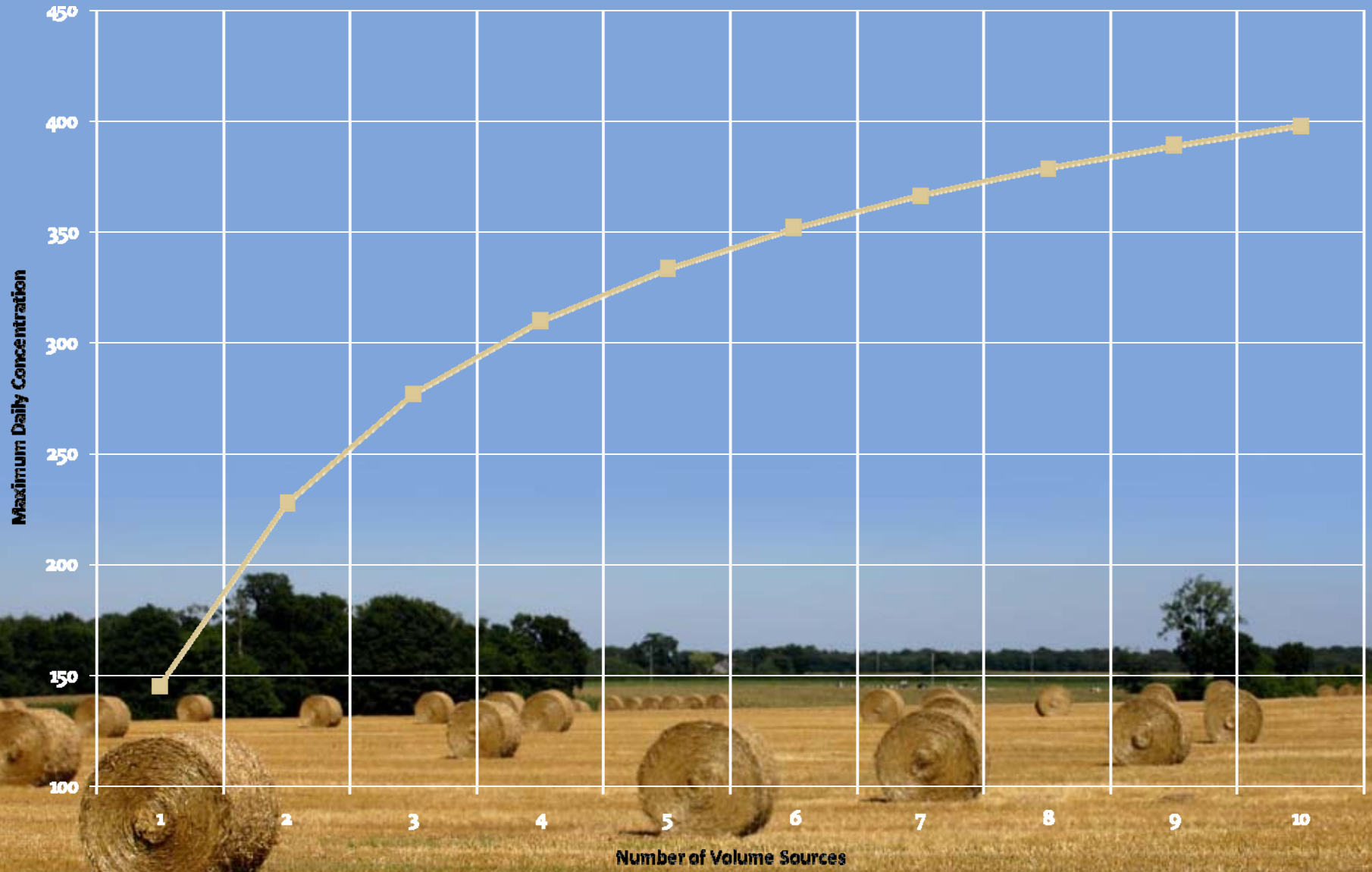
Large Farm Results Lagoon Reduced 50%



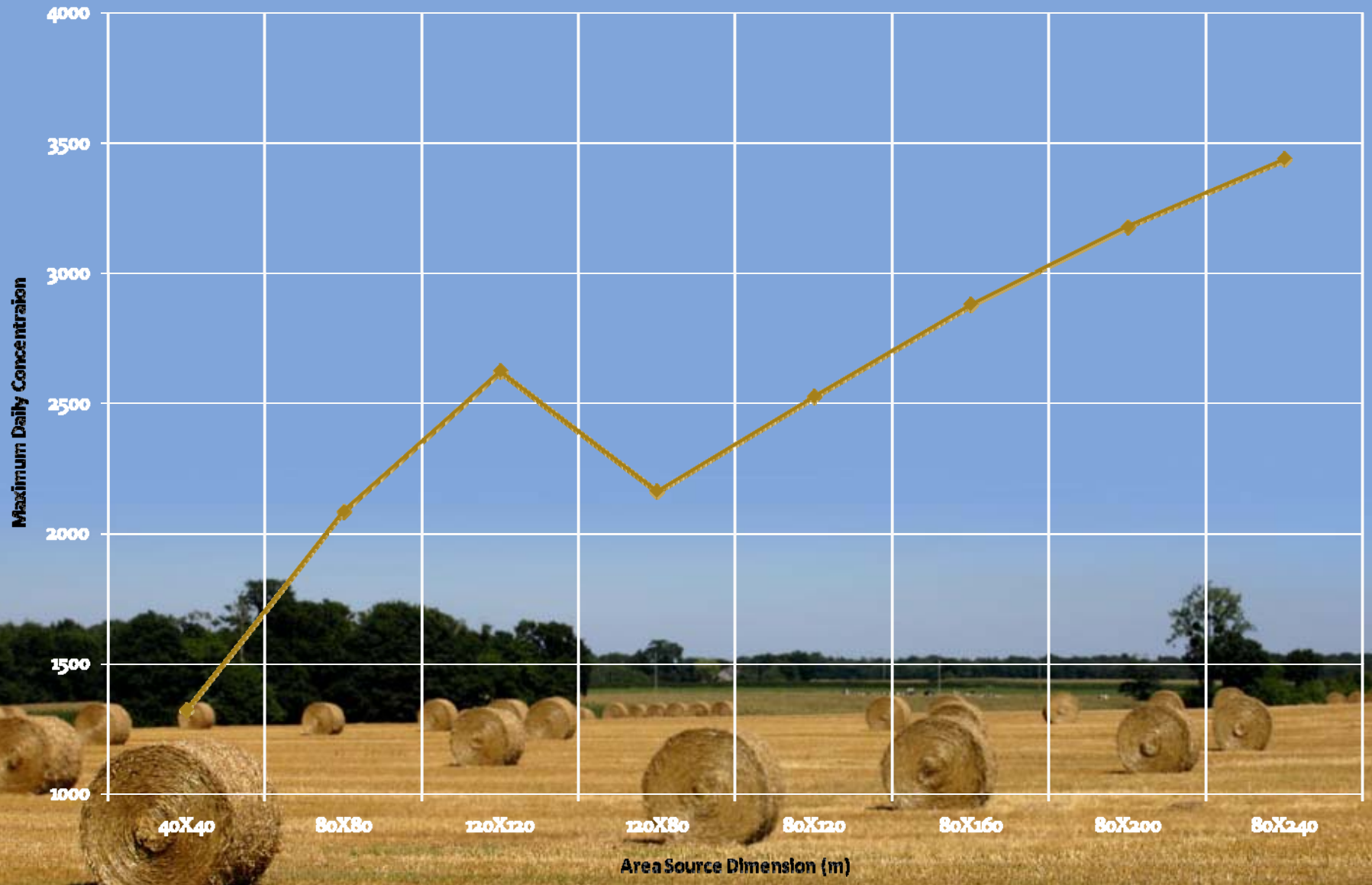
Large Farm Results Lagoon Reduced 99%



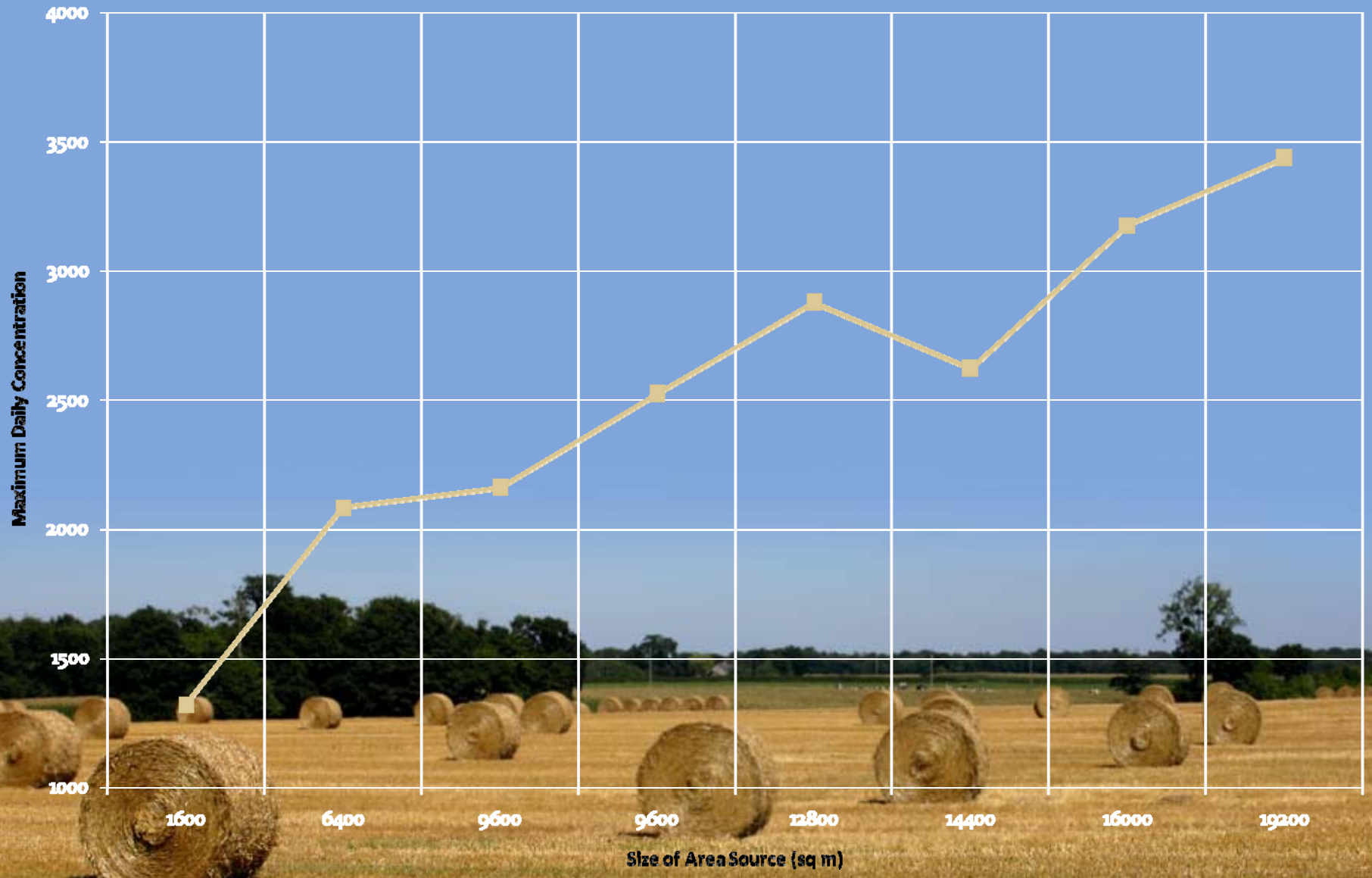
Barn Size Sensitivity



Area Source Dimension Sensitivity



Area Source Size Sensitivity



Future Directions

- Long-Term Ambient Monitoring
- Representative Emission Factors/Rates
- Consistent Application and Review
- Accuracy Dependent on Input Data (i.e. modeled source parameters/layout)

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