

EPA NONROAD Model Updates of 2008

“NONROAD2008”

**April 2009 International Emission Inventory
Conference**

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NONROAD2008 is an update of the NONROAD model and it supersedes all previous versions of this model. There is a corresponding update to the NMIM model.

The main change for NONROAD2008 is the inclusion of emission reductions associated with two rules finalized in 2008:

- * Diesel (CI) recreational marine standards in the Locomotive/Marine final rule**
(Federal Register Vol 73, No. 88, page 25098, May 6, 2008).
- * Small Spark Ignition (SI) and SI Recreational Marine final rule**
(Federal Register Vol 73, No. 196, page 59034, October 8, 2008),

Since the main difference between NONROAD2008 and NONROAD2005 is the accounting for new exhaust and evaporative emission controls, the newer version predicts substantially less HC and CO, and somewhat less NO_x and PM emissions than NONROAD2005 with use of comparable scenario inputs.

Any comparison depends greatly on pollutant, equipment type, year evaluated, and fuel choice -- especially how much ethanol is in the gasoline.

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Besides addition of controls associated with these new rules, there are some other model changes

- * **Added ability to model effects of ethanol blends on fuel tank and hose permeation, two new inputs:
ethanol blend market share
- volume percent ethanol (average) in the blend**
- * **Revised fuel tank and hose permeation emission factors for small SI (less permeation)**
- * **Updated some inputs for Phase 2 engines (especially decreased CO deterioration)**
- * **Added hot soak and running loss inputs for handheld equipment and SI recreational marine**
- * **Revised fuel consumption and 2-stroke PM emission factors for SI recreational marine engines**
- * **Updated diesel recreational marine Tier 2 emission factors per certification data as of mid-2006**

The charts compare model outputs by year for one basic scenario

- * **Nationwide 50 states + DC (Calif is treated like any other state)**
- * **Default equipment populations, activity, and growth**
- * **Use of the "Daily" Temperature and RVP option**
- * **Ethanol blend (E10) market shares increasing from 13% in 2000 to 79% in 2012**
- * **Diesel sulfur content decreasing over time to meet 15 ppm standard**

NONROAD Model Nationwide Average Fuel Properties Used for Model Version Comparisons

| Year | Diesel Sulfur ppm | | Ethanol Blends | |
|-------|-------------------|--------|----------------|-------|
| | Land | Marine | Market Share % | Vol % |
| 2000 | 2284 | 2640 | 13.5 | 8.2 |
| 2001 | 2284 | 2635 | 14.5 | 8.2 |
| 2002 | 2284 | 2637 | 17.0 | 8.2 |
| 2003 | 2284 | 2637 | 22.2 | 8.2 |
| 2004 | 2284 | 2637 | 27.3 | 8.2 |
| 2005 | 2284 | 2637 | 31.0 | 9.3 |
| 2006 | 2242 | 2588 | 41.5 | 9.3 |
| 2007 | 1139 | 1332 | 46.3 | 9.3 |
| 2008 | 351 | 435 | 57.5 | 9.3 |
| 2009 | 351 | 435 | 75.1 | 9.3 |
| 2010 | 165 | 319 | 78.8 | 9.5 |
| 2011 | 32 | 236 | 78.8 | 9.5 |
| 2012 | 32 | 124 | 78.8 | 9.5 |
| 2013 | 32 | 44 | 78.8 | 9.5 |
| 2014 | 20 | 52 | 78.8 | 9.5 |
| 2015 | 11 | 56 | 78.8 | 9.5 |
| 2016 | 11 | 56 | 78.8 | 9.5 |
| 2017 | 11 | 56 | 78.8 | 9.5 |
| 2018 | 11 | 55 | 78.8 | 9.5 |
| 2019 | 11 | 55 | 78.8 | 9.5 |
| 2020+ | 11 | 55 | 78.8 | 9.5 |

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Can Option (OPT) files from NONROAD2005 be used in NONROAD2008?

If you wish to properly model the effects of ethanol gasoline blends on permeation emissions, you must create new Option files that include the two new lines that specify ethanol blend market share and volume percent ethanol in the blend.

If you open an older option file in the Graphic User Interface (GUI), you will get a warning that there is a problem with the ethanol blend inputs; you can take care of this by entering appropriate values in the Scenario: Options form.

If you are only modeling exhaust emissions, or just diesel fueled equipment, or there is no ethanol in your gasoline, then Option files created with NONROAD2005 can be used with NONROAD2008.

Option files from model versions earlier than NONROAD2005 are not compatible with NONROAD2005 or NONROAD2008.

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Have the technical reports and User's Guide been updated for NONROAD2008?

For this limited release of NONROAD2008 the Users Guide and technical reports have not yet been updated.

Details of the changes and the basis of those changes from NONROAD2005 can be found in the technical documentation for (a) the 2008 Small SI and SI Recreational Marine FRM (RIA and docket memos) and (b) the 2008 Loco/Marine FRM.

The User's Guide and technical reports were updated for NONROAD2005. Those documents can be downloaded from the NONROAD model web site at:

www.epa.gov/otaq/nonrdmdl.htm

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Should I use NONROAD2008 or NMIM2008?

NMIM2008 (the National Mobile Inventory Model) is a consolidated emissions modeling system using EPA's MOBILE6.2 and NONROAD2008 models.

www.epa.gov/otaq/nmim.htm

NMIM generates county inventories using MOBILE6.2 and NONROAD2008 at scales ranging from individual counties to the nation. Its primary improvement over NONROAD2008 is the inclusion of all the required county temperature and fuel property data for the nation in a single database. In addition to the pollutants produced by NONROAD2008, NMIM2008 produces inventories for gaseous hazardous air pollutants (HAPs), polyaromatic

Since NMIM2008 incorporates NONROAD2008, the common pollutant inventories produced by each (i.e., HC, CO, CO₂, NO_x, PM, and SO₂) will be the same, provided the same inputs are used.

NMIM2008 will need to be used if toxic inventories are required.

NONROAD2008 must be used if equipment populations or fuel consumption estimates are required, or if output by model year is required.

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What is EPA's policy guidance on the use of NONROAD2008 versus NONROAD2005 for SIP and conformity purposes?

NONROAD2008 is a significant update of the NONROAD model and should be used in analyses to meet any regulatory requirements that call for the development of new nonroad inventories.

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What additional changes are currently underway or being considered for the next version of the NONROAD model?

Work is underway to transform NONROAD into a database driven java application for incorporation into the MOVES model, so that modeling of nonroad equipment and onroad vehicles can be accomplished using the same comprehensive model.

The current plan is to include a draft version of the nonroad modeling capability in the release of Final MOVES2009 (for onroad vehicles) near the end of 2009. That version would not be expected to yield substantially different results compared to NONROAD2008.

For more information on MOVES, see <http://www.epa.gov/otaq/models.htm>

EPA NONROAD Model Contact Information

Web: www.epa.gov/otaq/nonrdmdl.htm

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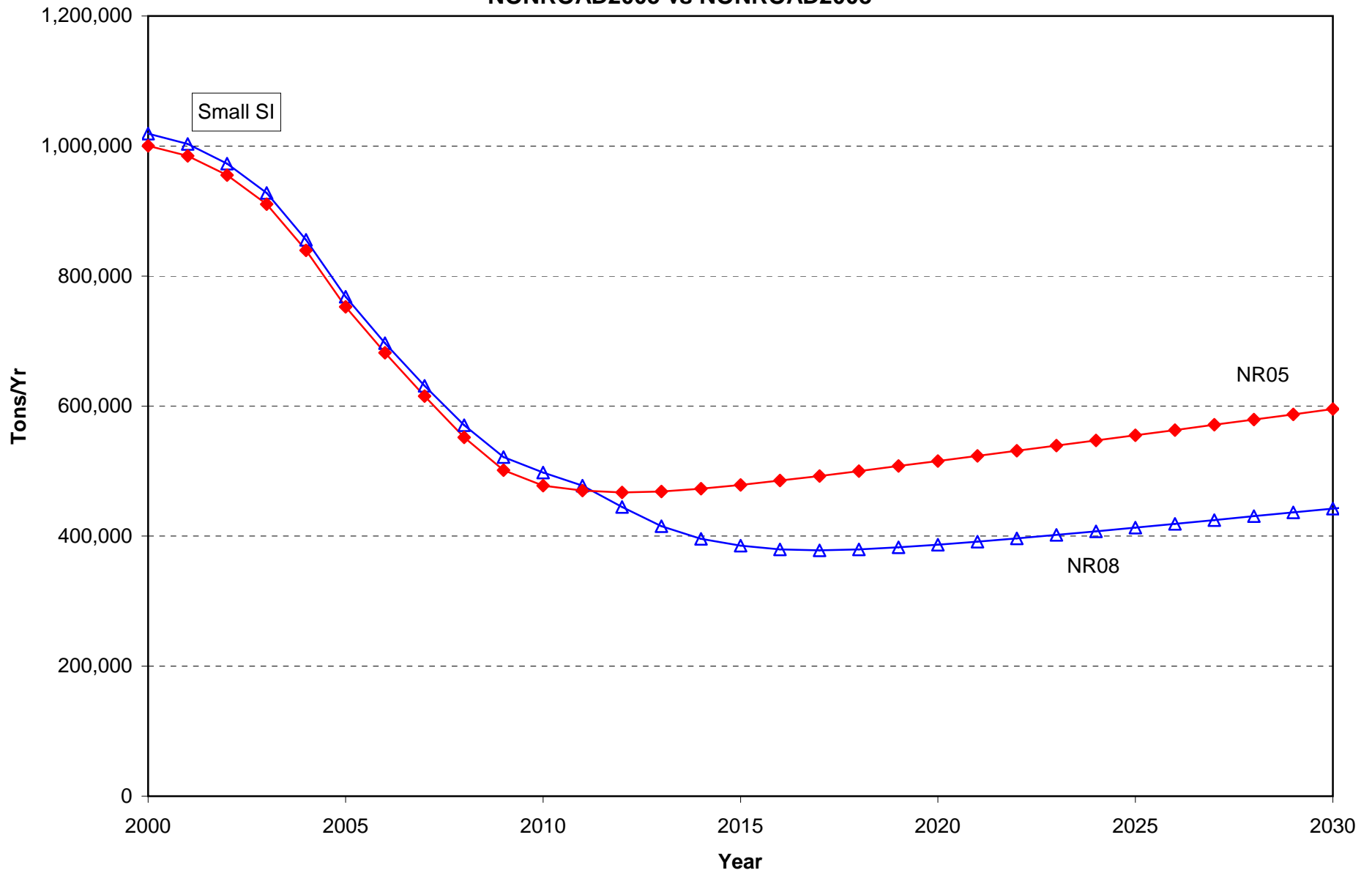
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Air Quality and Modeling Center

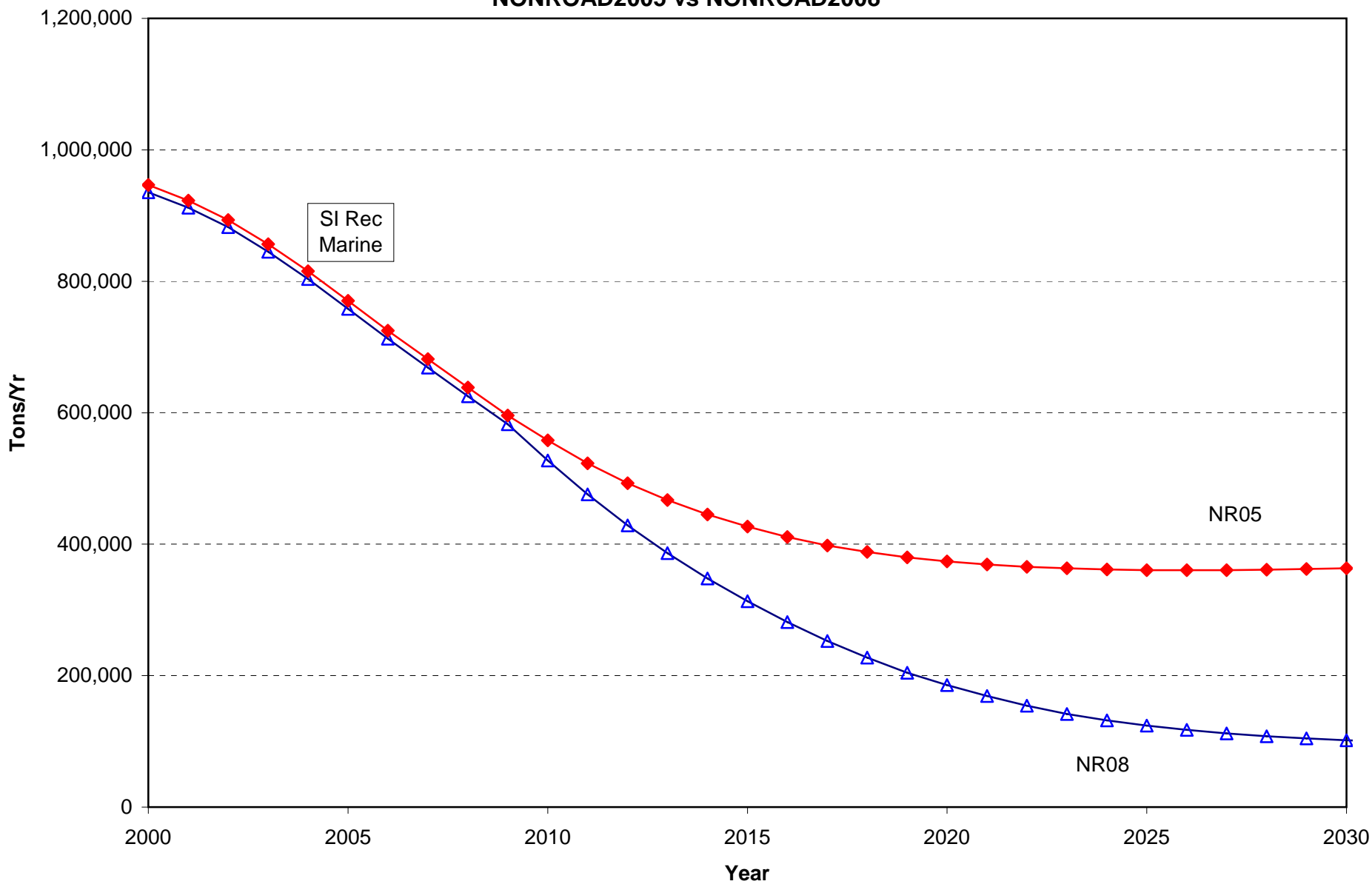
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Ann Arbor, MI 48105

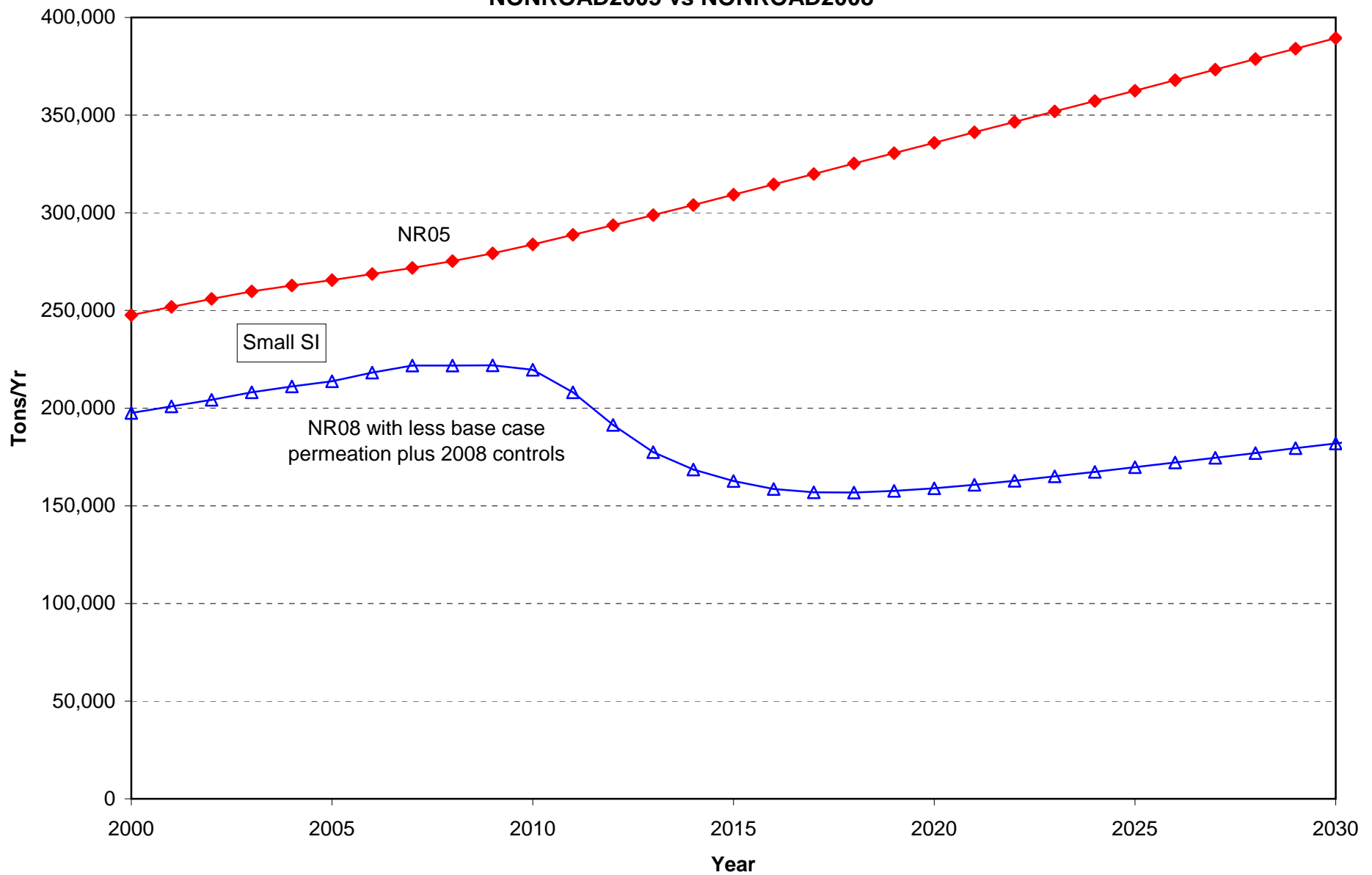
Small SI THC exhaust Changes NONROAD2005 vs NONROAD2008



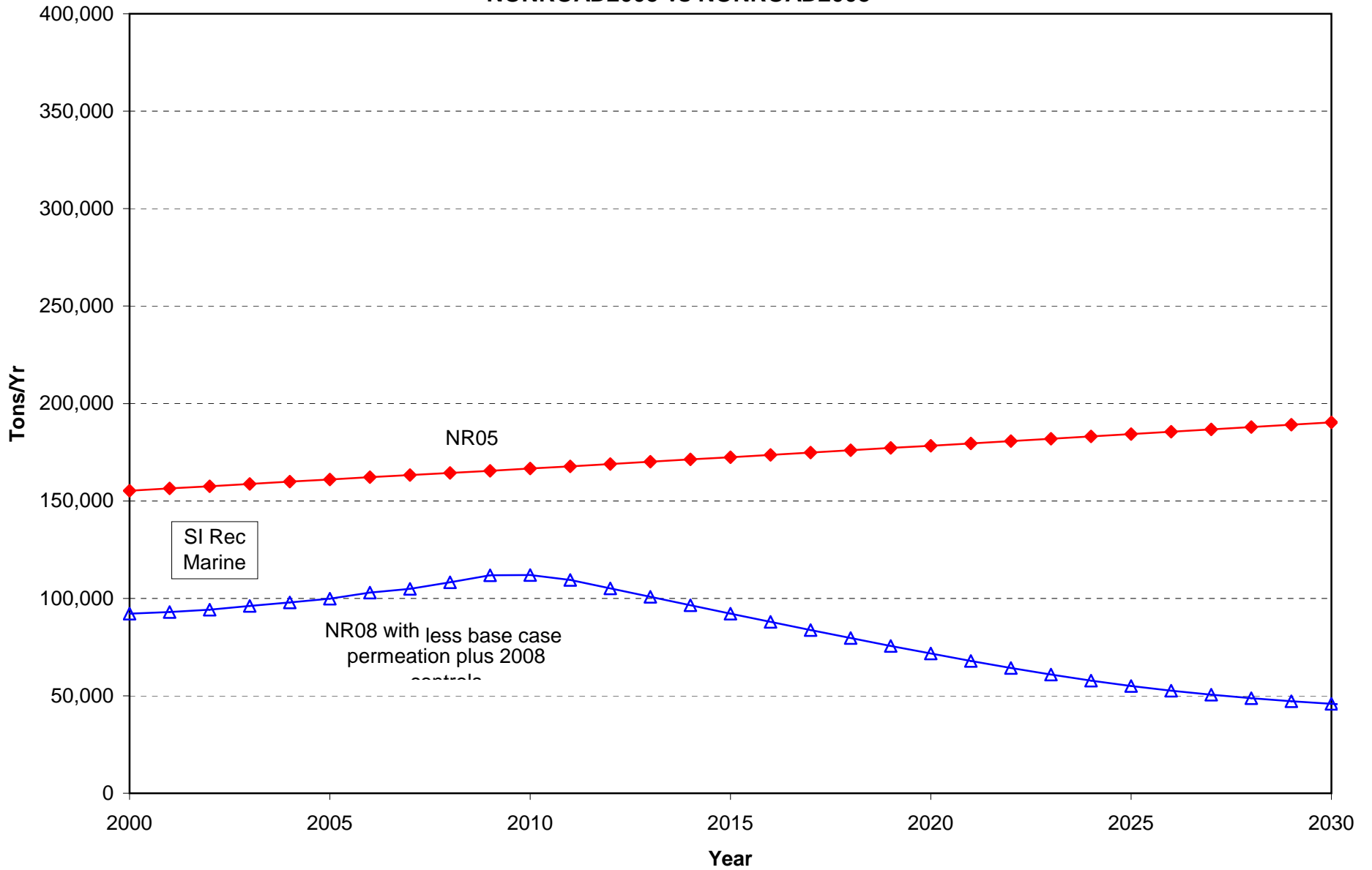
SI Recreational Marine THC exhaust Changes NONROAD2005 vs NONROAD2008



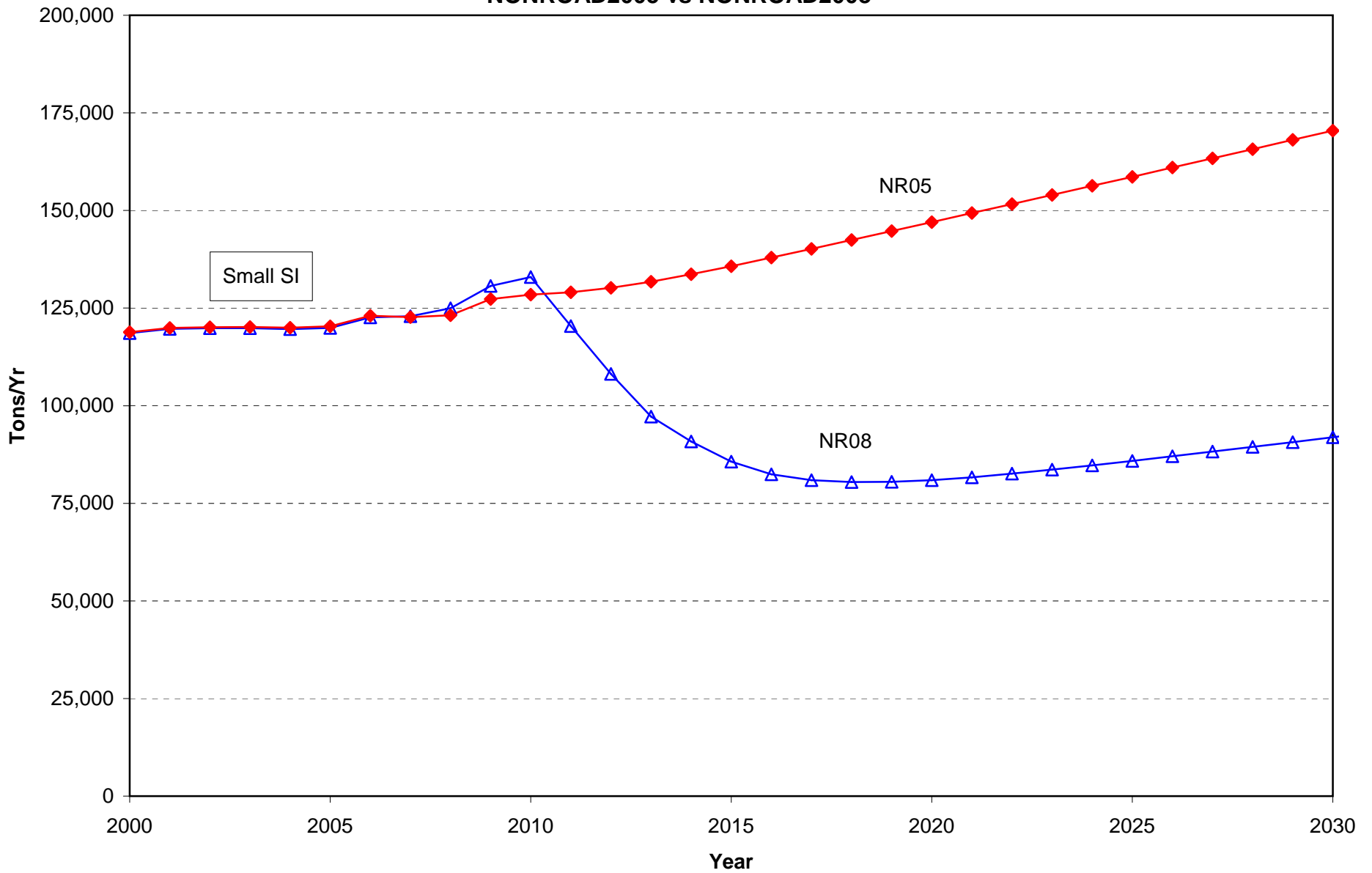
Small SI THC evap Changes NONROAD2005 vs NONROAD2008



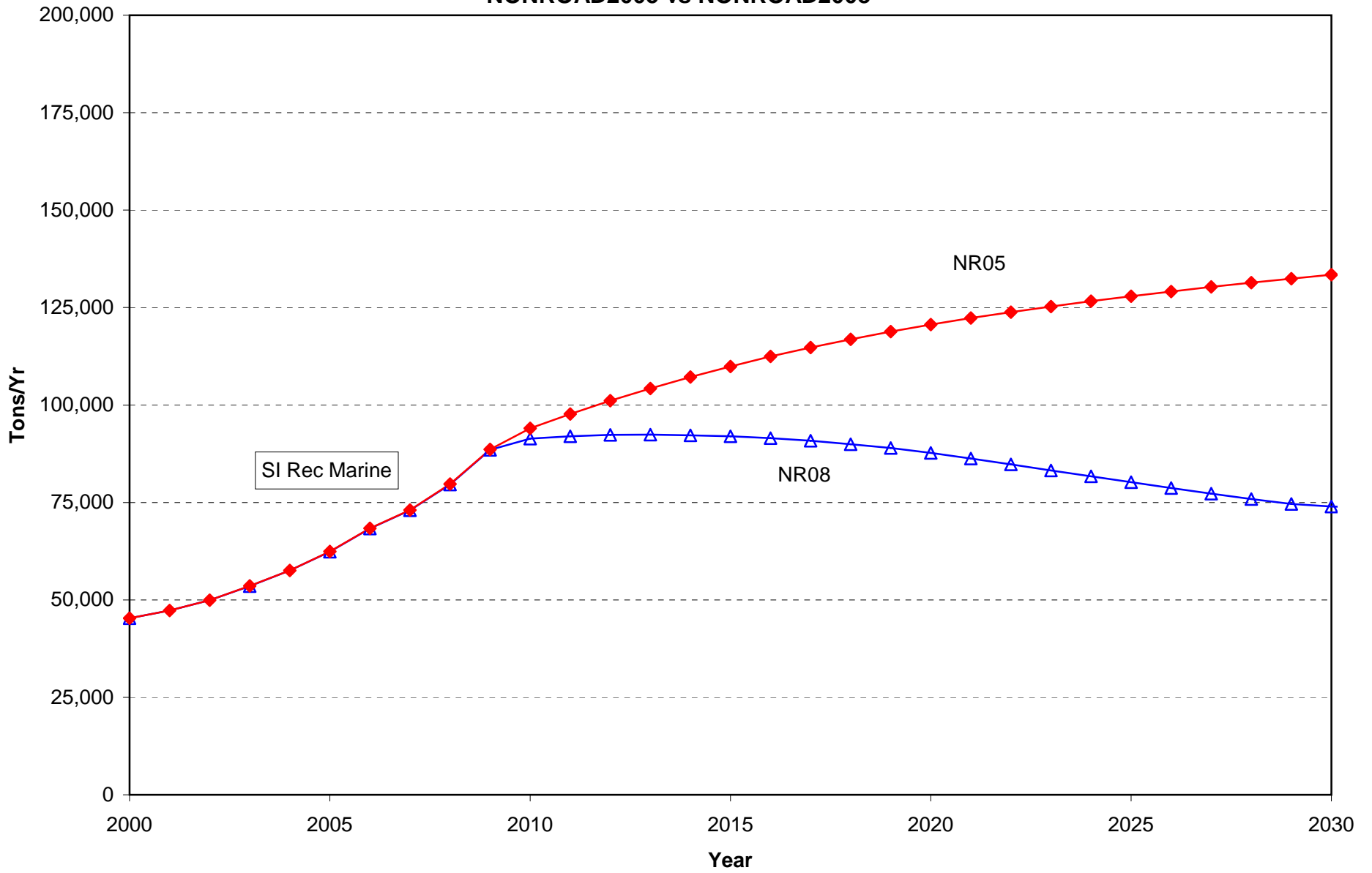
SI Recreational Marine THC evap Changes NONROAD2005 vs NONROAD2008



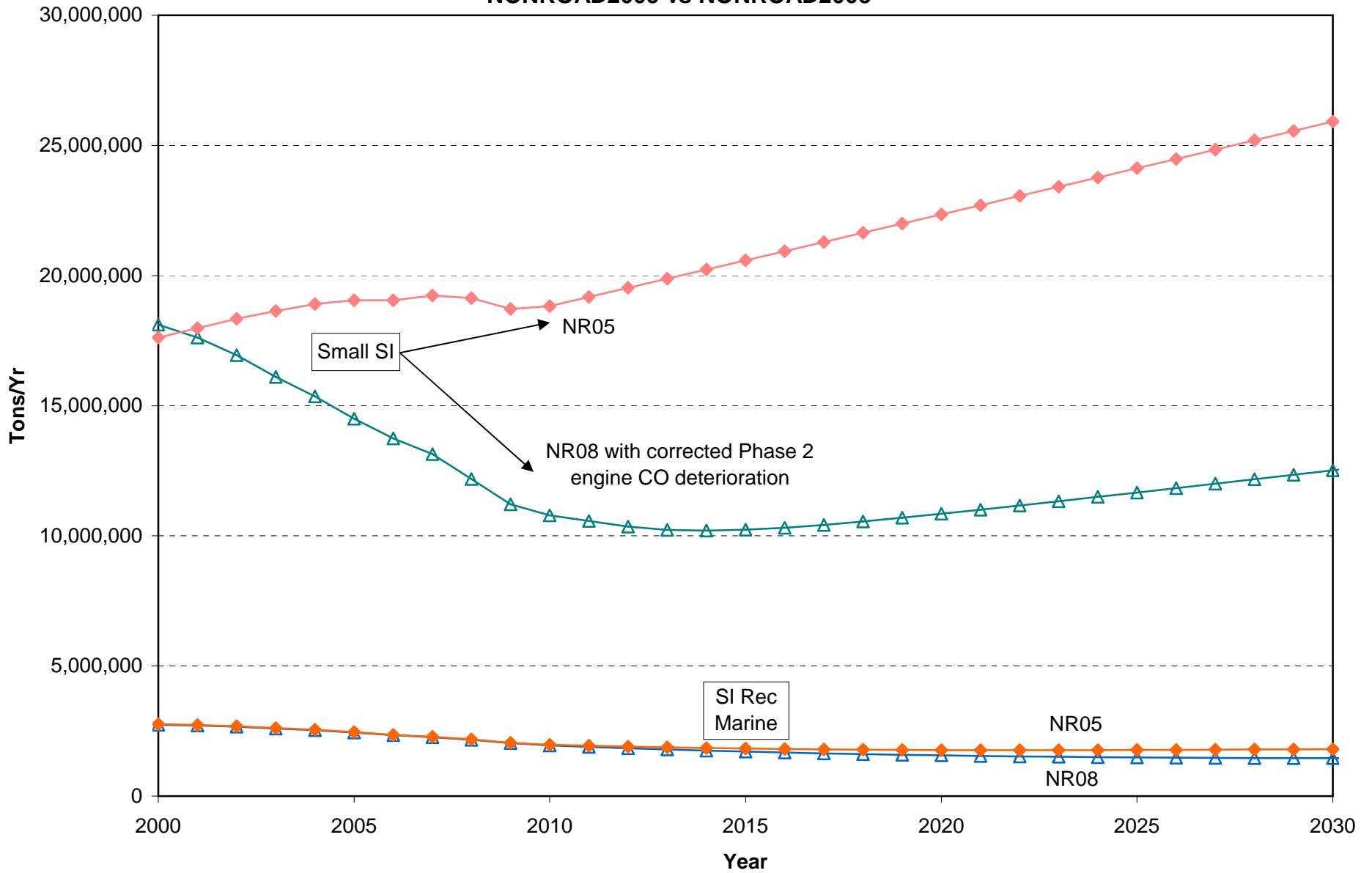
Small SI NOx Changes NONROAD2005 vs NONROAD2008



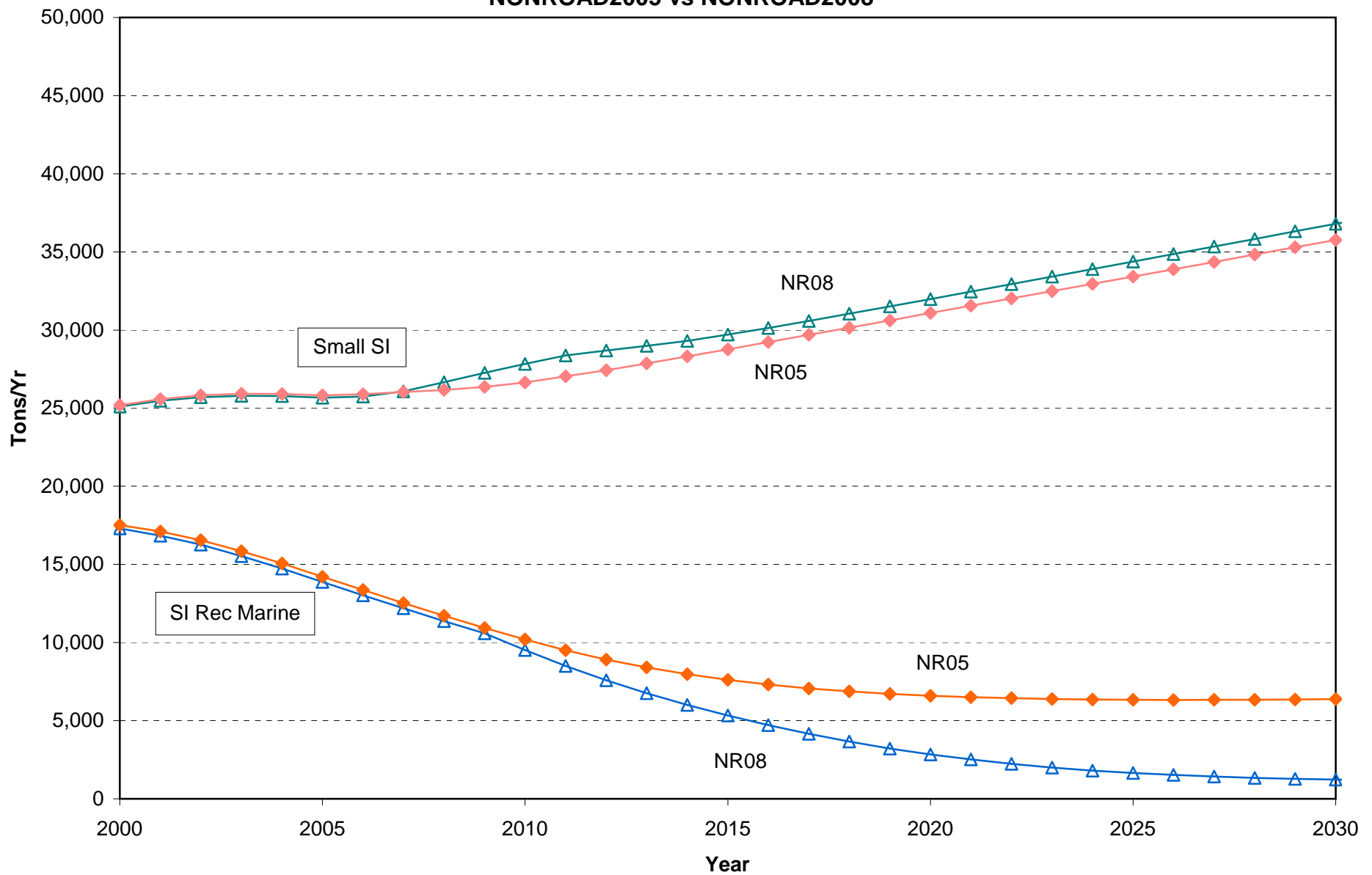
SI Recreational Marine NOx Changes NONROAD2005 vs NONROAD2008



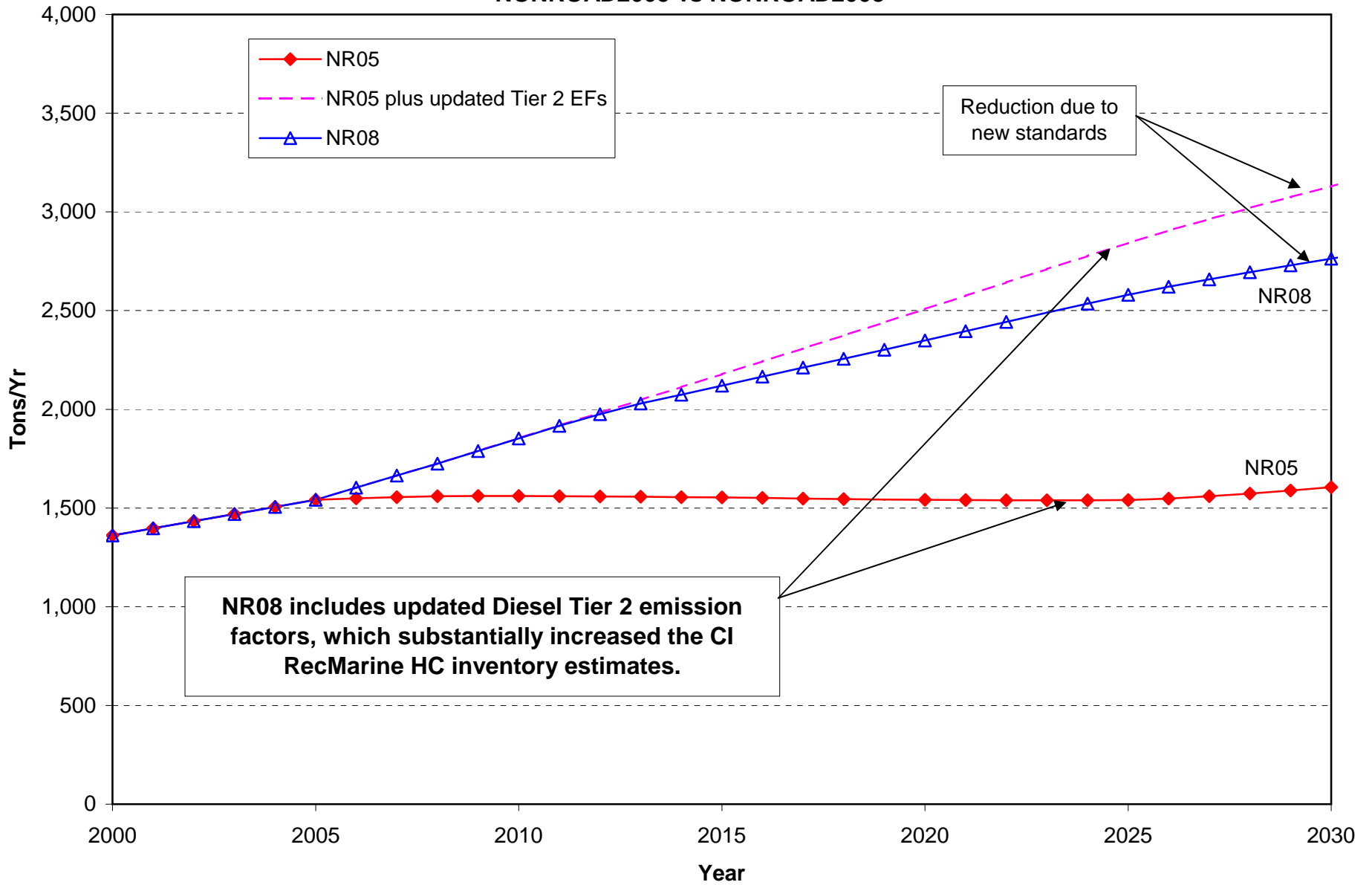
Spark Ignition CO Changes NONROAD2005 vs NONROAD2008



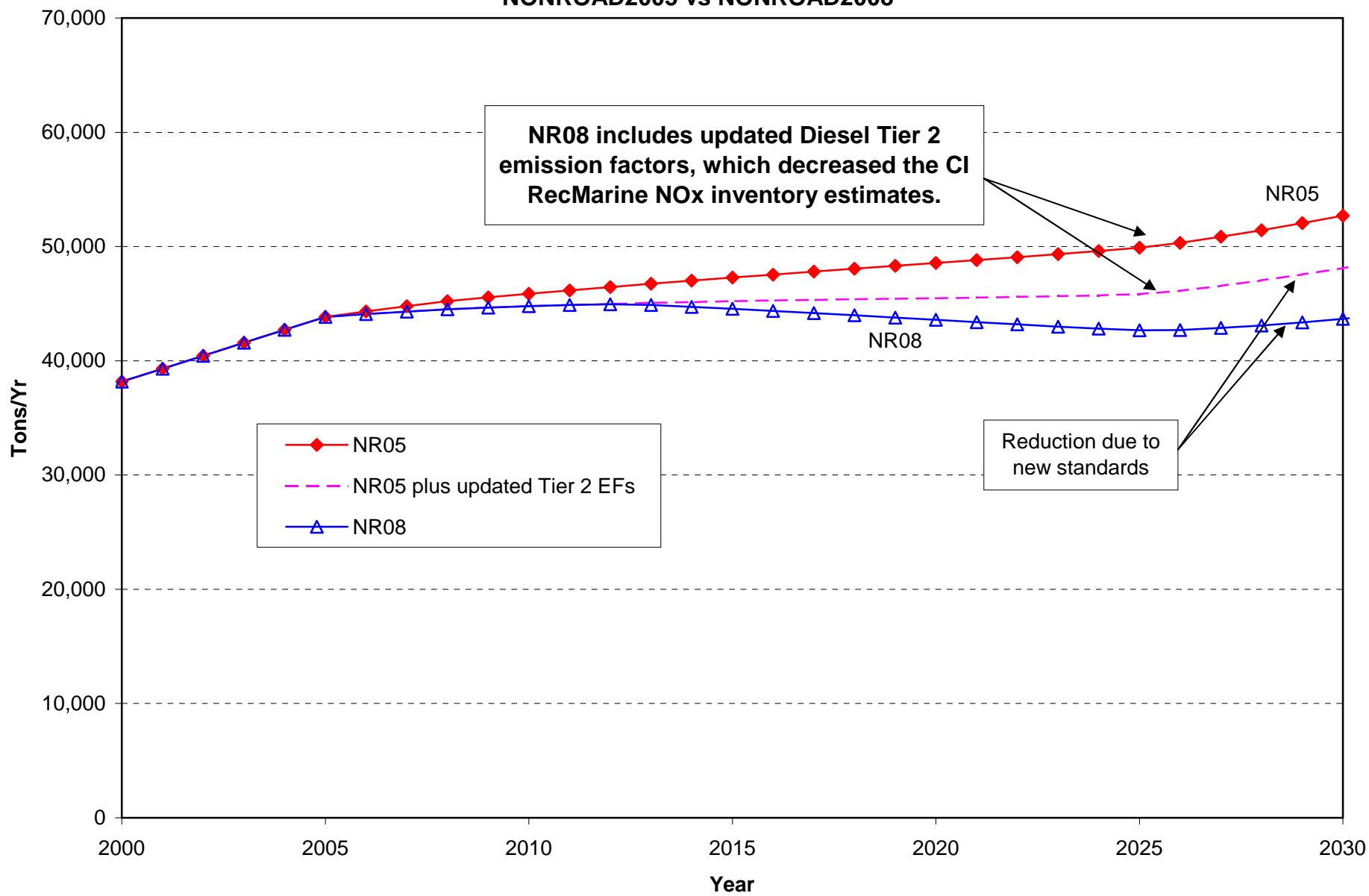
Spark Ignition PM2.5 Changes NONROAD2005 vs NONROAD2008



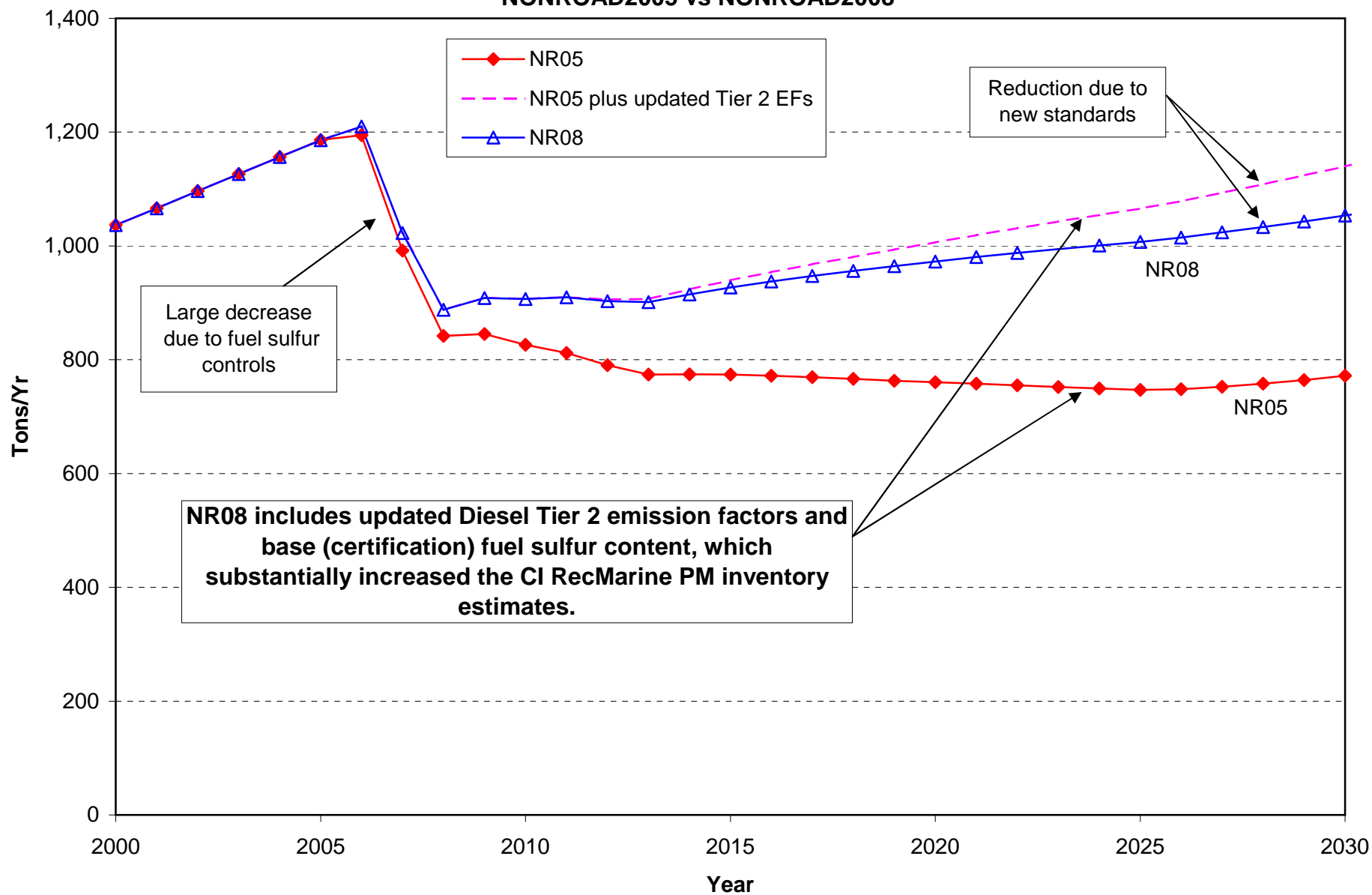
Diesel Recreational Marine THC Changes NONROAD2005 vs NONROAD2008



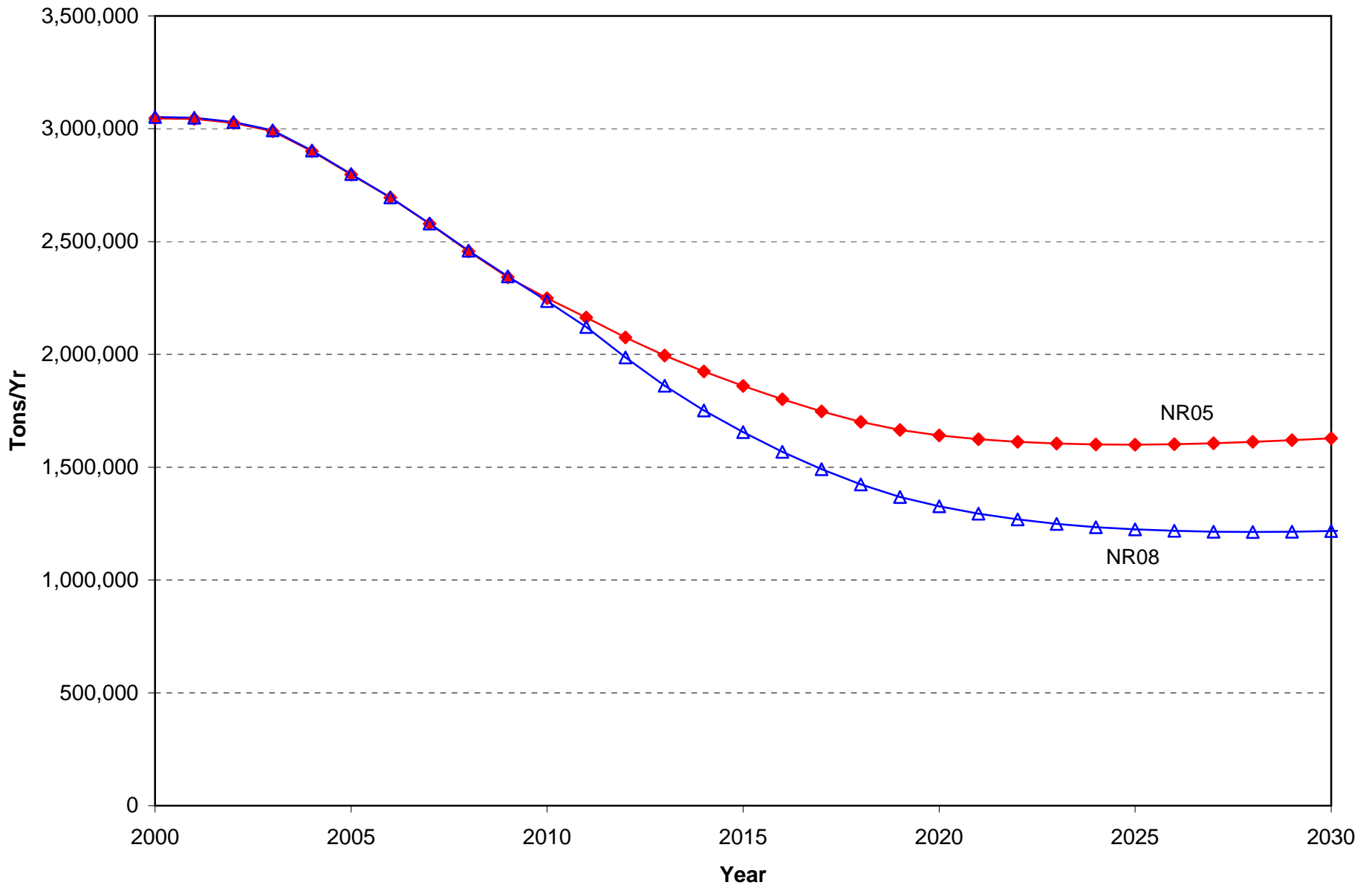
Diesel Recreational Marine NOx Changes NONROAD2005 vs NONROAD2008



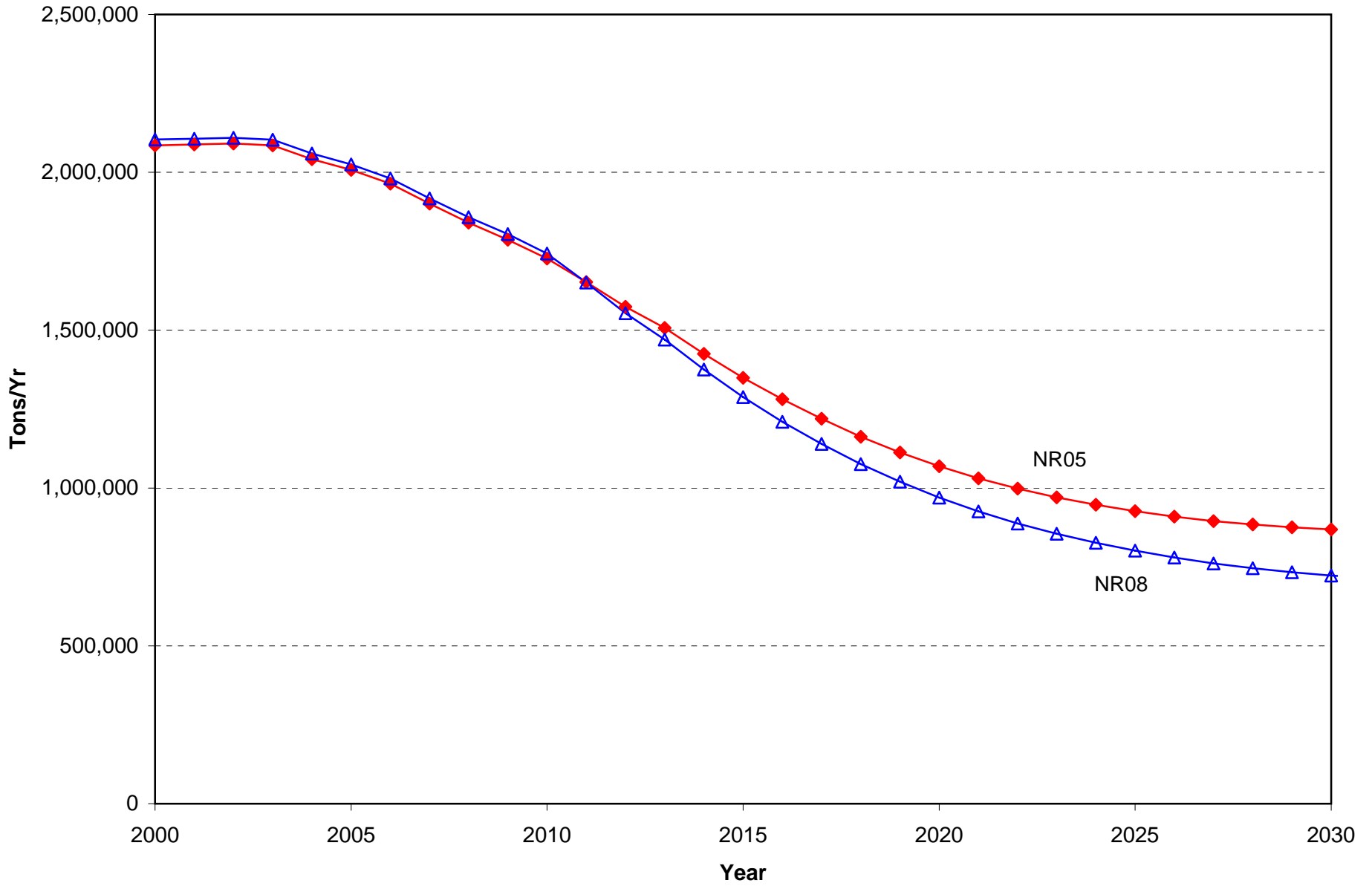
Diesel Recreational Marine PM_{2.5} Changes NONROAD2005 vs NONROAD2008



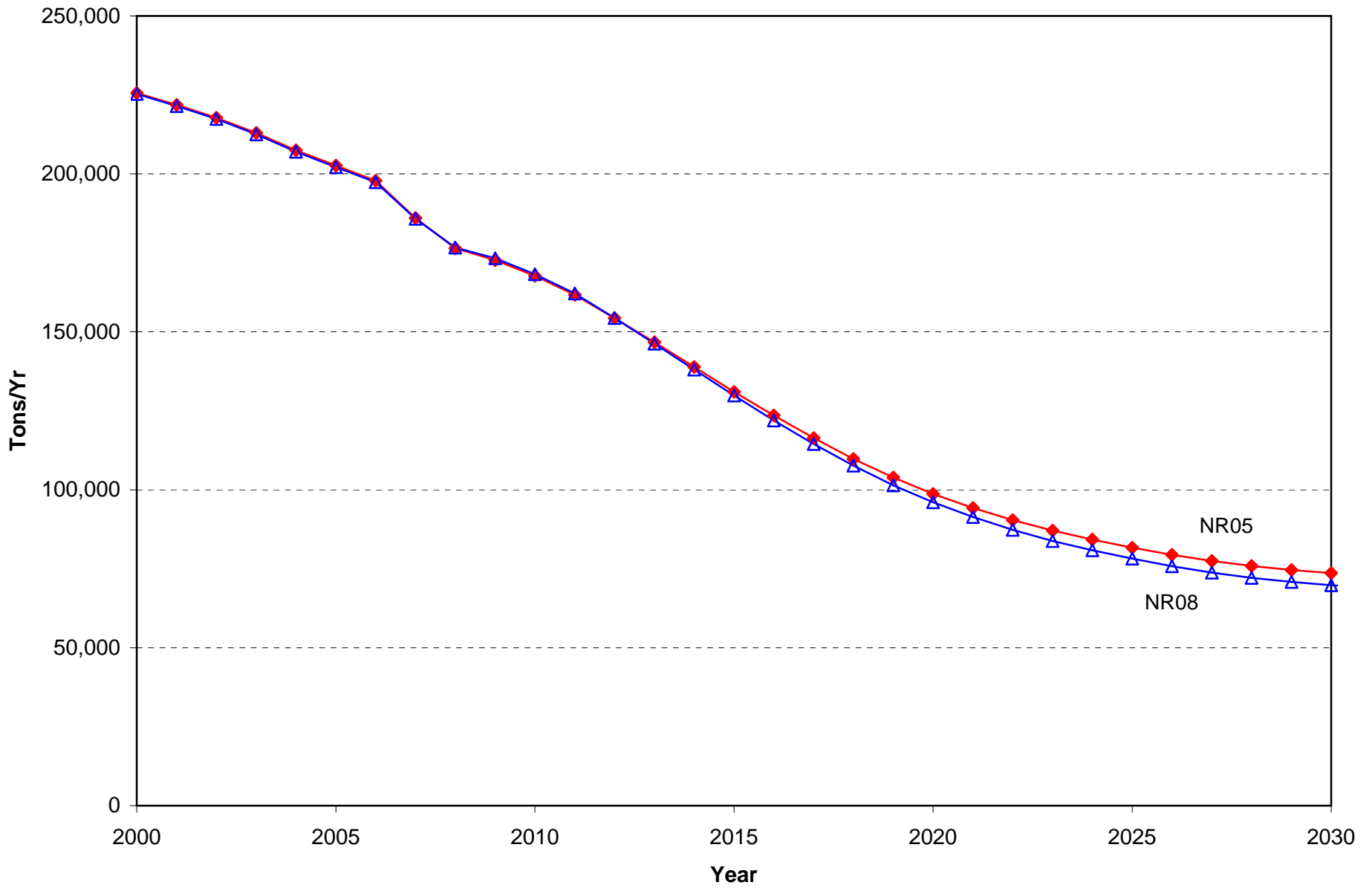
NONROAD CI+SI Total VOC (exh+evap)



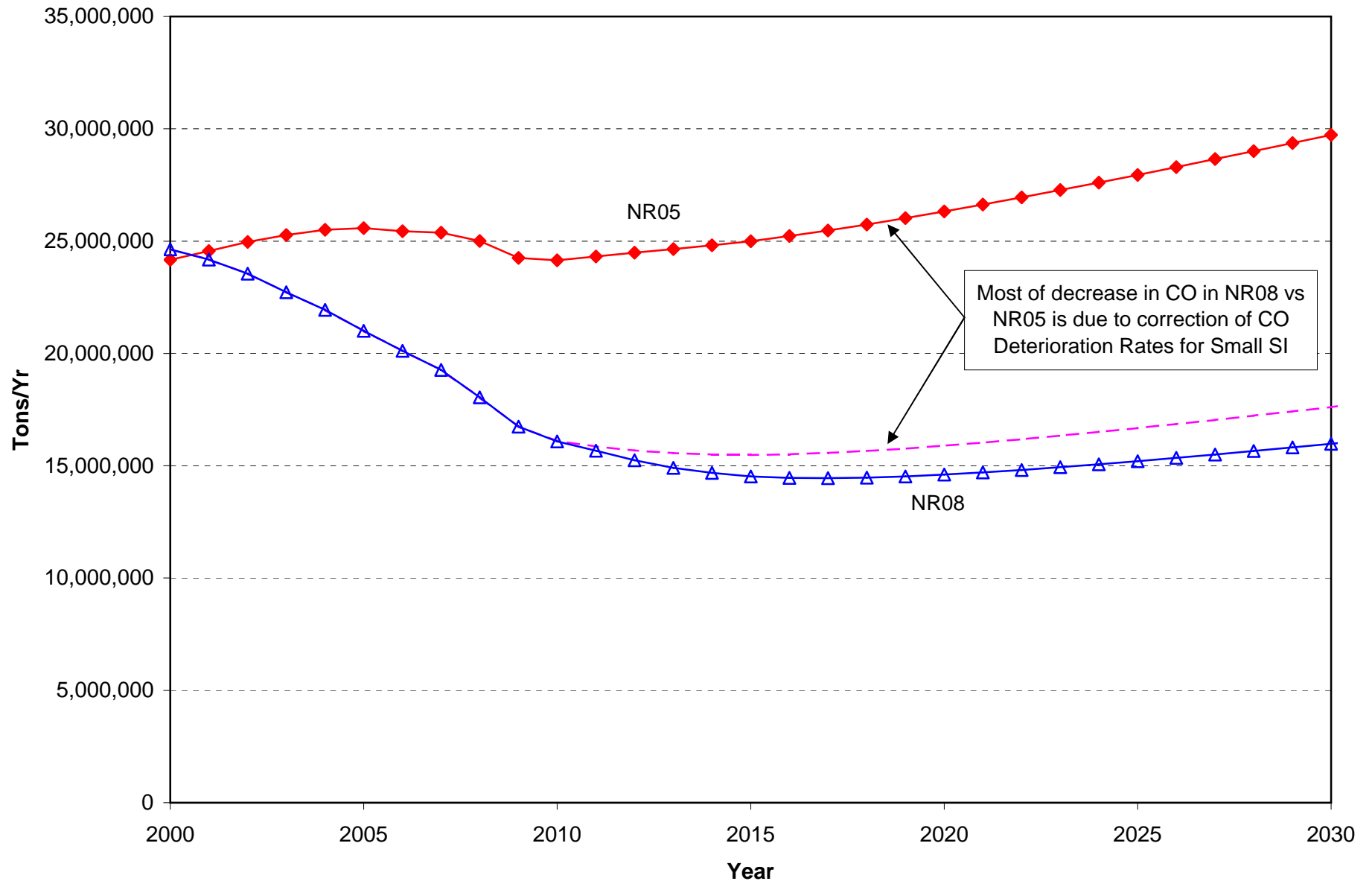
NONROAD CI+SI Total NOx



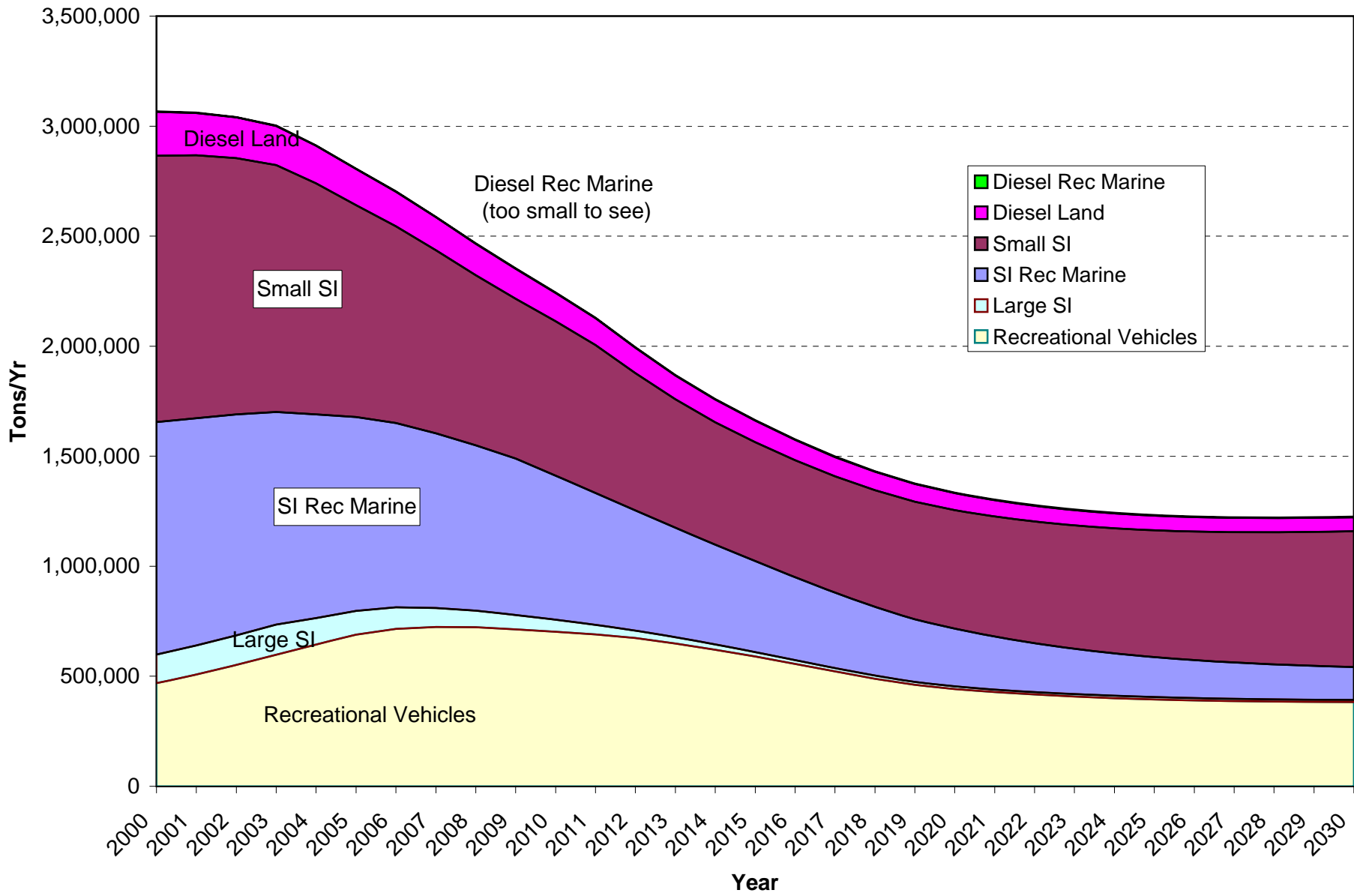
NONROAD CI+SI Total PM2.5



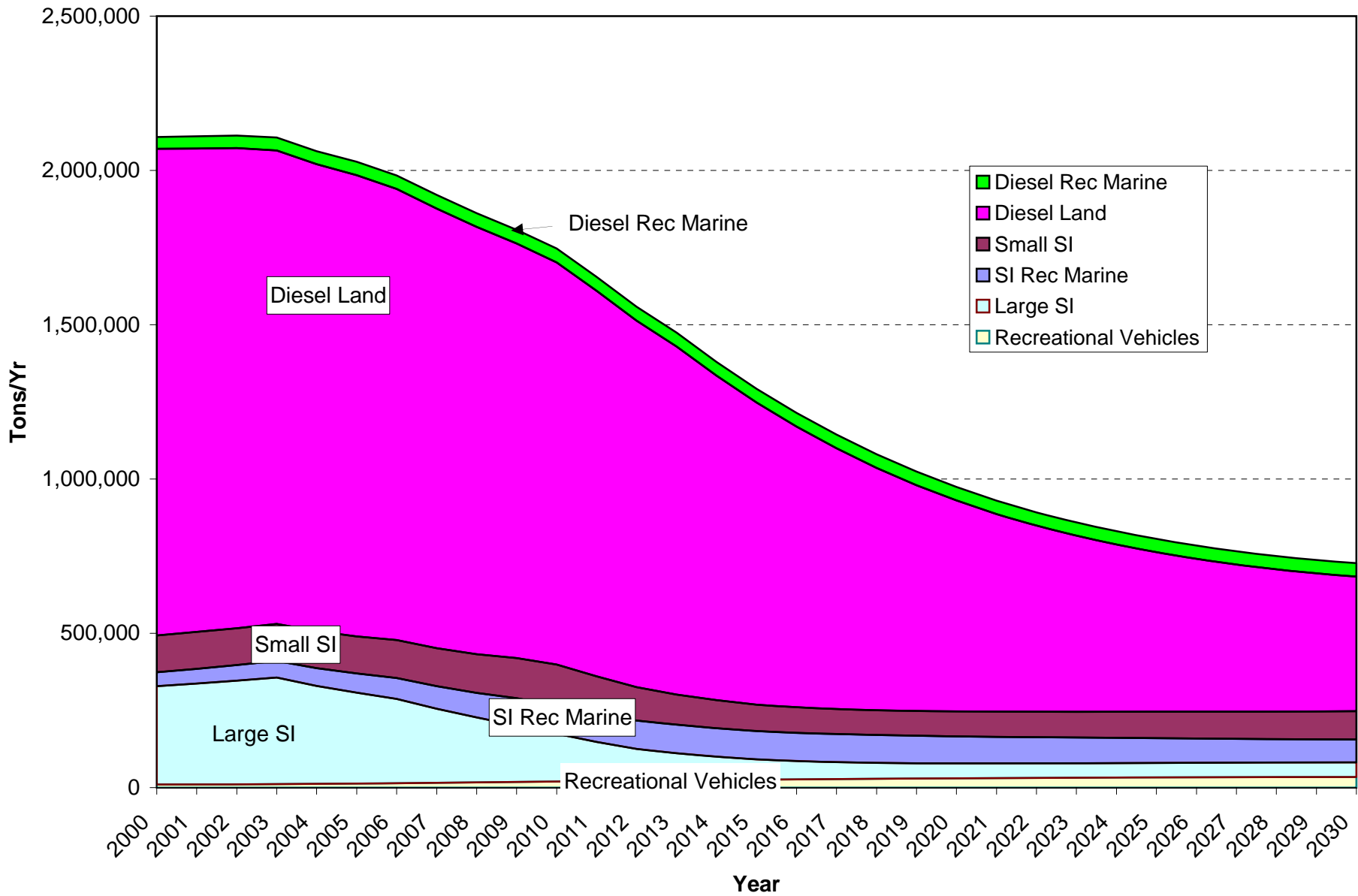
NONROAD CI+SI Total CO



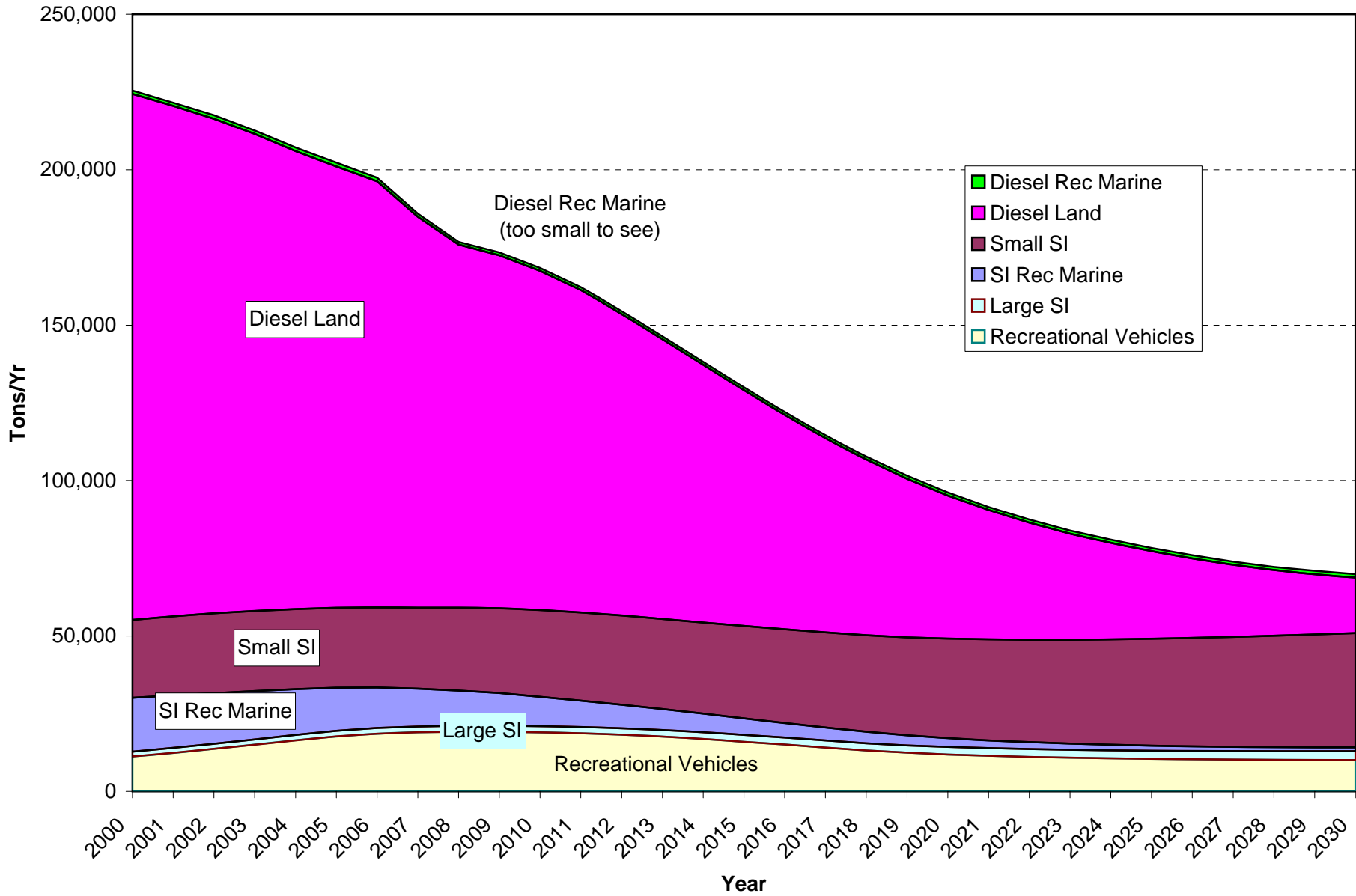
NONROAD2008 VOC (exh+evap)



NONROAD2008 NOx



NONROAD2008 PM2.5



NONROAD2008 Carbon Monoxide

