FINAL REPORT

Screening of Highway 169 Improvement Alternatives for Potential Water-Quality Impacts

prepared for

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Introduction

This report evaluates potential water quality impacts associated with various alternatives for improvement of Highway 169 adjacent to Mille Lacs Lake, one of the most important natural and economic resources in Minnesota (Heiskary et al, 1994). Simple water and mass-balance models are used to estimate the general magnitude of impacts associated with each alternative for key water-quality constituents. A screening exercise is performed to determine the extent to which absolute or relative magnitudes of water quality impacts might drive the selection of a specific highway alternative. The report does not contain a comprehensive water-quality impact analysis or ranking of specific alternatives, but may serve as one component of such an effort.

The analysis focuses on phosphorus loads, which have direct and indirect impacts on the lake trophic state and beneficial uses. Suspended solids, road salt, and a hypothetical tracer for traffic-related contaminants (e.g., heavy metals from deterioration of vehicles) are also considered. There is much more information available for modeling phosphorus, as compared with other contaminants. Phosphorus is also relatively persistent (slowly removed as a result of sedimentation and other natural purification processes) in natural waters, as compared with most urban runoff contaminants, which tend to be more heavily associated with particles (Athayede et al., 1983). Most other contaminants would be trapped more efficiently in BMP's and in regional wetlands and lakes before reaching Mille Lacs. Therefore, evaluation of changes in phosphorus concentration under each alternative in one sense provides a worst-case surrogate for other contaminants. The exception is road salt, which is transported efficiently and evaluated separately.

Initial sections of the report describe historical trends in lake water quality and nutrient budgets. A simple mass-balance model is developed for routing flow and pollutant loads through the network of streams and lakes draining into Mille Lacs and other project areas outside of the Mille Lacs watershed. Conservative assumptions are made, where appropriate, to account for uncertainties in the model structure and calibration. The

model is used to estimate changes in flow, loading, and concentration likely to result from each of six highway alternatives. Potential modes of highway impact include increased surface runoff, increased applications of road salts for deicing, and increased loadings of contaminants associated with vehicle traffic. Potential water-quality changes are evaluated relative to existing conditions and in the context of a projected regional increase in urban development and improvements in wastewater management. It is assumed that future construction associated with each highway alternative and urban development in general will not encroach upon existing waterbodies or wetlands in the watershed. Potential benefits of applying Best Management Practices (BMP's) to future highway segments and urban developments are evaluated. Long-term implications for management of Mille Lacs water quality are discussed.

Lake Data Analysis

To provide a background for the highway impact analysis, this section summarizes recent and historical data on eutrophication-related water quality conditions in Mille Lacs. Trophic state, long-term trends, and sensitivity to phosphorus are evaluated. Nutrient enrichment can have significant impacts on lake water quality, biota, and beneficial uses (USEPA, 2000). Because phosphorus usually limits algal productivity and resulting water quality impacts in lakes, control of phosphorus loadings is typically a major management concern. Significant increases in point and nonpoint nutrient loadings can occur as a consequence of watershed development. Without appropriate controls, urban development can increase phosphorus export from a given watershed by a factor of 10 or more as a consequence of increased impervious area and associated surface runoff (Reckhow et al, 1980; Walker, 1985b).

Long-term trends in Mille Lacs phosphorus, chlorophyll-a, and transparency levels over the 1971-2000 period are shown in Figure 1. These variables are typically used for classifying lakes with respect to trophic state (Carlson, 1977; USEPA, 2000). Limited historical data are available for phosphorus (4 years) and chlorophyll-a (3 years). Surveys were conducted in 1971, 1980, 1992, and 2000. Transparency was routinely

measured between 1988 and 2000. Despite the limited phosphorus and chlorophyll-a data, there is some indication of improved water quality conditions (lower phosphorus, lower chlorophyll-a, and higher transparency) in the 1990's, as compared with the 1970's - 1980's. Heiskary et al. (1994) also noted the possibility of a "slight decrease in trophic state (improvement in water quality)", based upon analysis of 1971-1992 data. Based upon the chlorophyll-a and transparency data, however, there is no indication of a trend in trophic state after the mid 1990's.

Figure 2 shows trends in the same data expressed in terms of Trophic State Indices (TSI's, Carlson, 1977). TSI's translate phosphorus, chlorophyll-a, and transparency measurements onto a common scale based upon correlations among these measurements developed from data collected in other northern temperate lakes. Eutrophic lakes generally have TSI levels exceeding 50, mesotrophic lakes between 40 and 50, and oligotrophic lakes less than 40. Improving water quality conditions are suggested by trend slopes ranging from -.29 to -.42 TSI units per year over the entire period. As indicated above, however, there is no indication of trend after the mid 1990's. Results suggest that conditions bordering on eutrophic (TSI > 50) were present during the 1980's, but within the mesotrophic range during the 1990's. Mesotrophic conditions are generally considered to be compatible with recreation and warm-water fisheries, major designated uses for Mille Lacs (Heiskary et al., 1994; USEPA, 2000).

Water-column phosphorus measurements would not reflect all of the potential changes in the lake ecosystem related to nutrient enrichment. It is possible, for example, some of the apparent improvements in water-column conditions may reflect increased growth of aquatic vegetation in shoreline areas. Such growth would tie up some of phosphorus that would otherwise remain in the water column and support algal growth. Increases in transparency may partially reflect reductions in sediment re-suspension from shoreline areas stabilized by aquatic vegetation. Changes in the magnitude and structure of the fishery could also affect phosphorus cycling and retention. Long-term monitoring data from lake tributaries are not available to support evaluation of trends in nutrient loading. Thus, a clear linkage between the apparent historical improvements in water-column

conditions and reductions in external nutrient loading cannot be established from existing information.

Figure 3 relates lake-mean phosphorus concentration to the frequency or risk of algal blooms, based upon a linkage of Carlson's (1977) TSI equations with Walker's (1984) bloom frequency model. Summer-mean chlorophyll-a is predicted as a function of mean phosphorus using Carlson's regression ($Chla = 0.068\ P^{1.47}$) with the intercept adjusted from 0.068 to 0.062 to match the average phosphorus and chlorophyll-a values measured in 2000 (17.3 ppb & 4.1 ppb, respectively). Temporal variability in chlorophyll-a within a given summer is modeled as a lognormal distribution with a coefficient of variation of 0.37 (also calibrated to 2000 data). Bloom frequency is defined as the percent of summer days with lake-mean chlorophyll-a concentration exceeding a specified bloom criterion. Figure 3 shows predicted bloom frequencies as a function of phosphorus for typical bloom criteria of 10 ppb (algae visible), 20 ppb (nuisance conditions), and 30 ppb (severe nuisance conditions). Similar relationships have been used in developing phosphorus criteria for Minnesota lakes (Heiskary & Walker, 1988). The model exhibits a threshold effect in response to increasing phosphorus concentrations. The 1980 phosphorus concentration in Mille Lacs (~ 30 ppb, Figure 1) was near the threshold for onset of nuisance algal blooms (Chl-a > 20 ppb). In 2000 phosphorus concentration (17 ppb) was near the threshold for onset of visible blooms (Chl-a > 10 ppb).

While existing phosphorus levels and trophic state appear to be compatible with designated uses, Figure 3 demonstrates the importance of maintaining phosphorus concentrations at or below existing levels to avoid the onset of perceptible algal blooms. Potential impacts of increases in phosphorus on the structure and quantity of fish populations are also an important consideration in this Lake, but would be more difficult to quantify. While increases in phosphorus levels are sometimes associated with increases in overall fish abundance, there may be a decline in desirable species that are more sensitive to water quality (USEPA, 2000).

Lake Phosphorus Budgets

Table 1 summarizes water and phosphorus budgets for Mille Lacs Lake from various sources (Heiskary et al., 1994; MPCA, 2001; this study). These reflect a range of development scenarios (existing, undeveloped, future), hydrologic conditions (1992, 2000, average), data sources, and assumptions regarding budget components that are not directly measured (e.g., direct runoff from shoreline areas, groundwater, unmonitored tributaries, shoreline septic tanks, atmospheric loads, winter angling). Estimates of nonpoint watershed loads from tributaries and immediate shoreline range from 3,365 kg/yr to 5,640 kg/yr. Estimates of atmospheric loads range from 8,045 to 26,825 kg/yr. Other load components (point sources, septic tanks, winter angling) range from 0 to 2,051 kg/yr. Because of the relatively small ratio of watershed area to lake surface area (~1.0), atmospheric fluxes are relatively large components of the water (precipitation, evaporation) and phosphorus (deposition) budgets. Because they are difficult to measure directly, estimates of precipitation, evaporation, groundwater inflows, inputs from shoreline septic tank systems, and atmospheric phosphorus deposition introduce a considerable uncertainty into the overall water and phosphorus budgets.

Estimates of loads from the watershed are of primary importance for evaluating the potential effects of highway alternatives and urban development. Expressing loads in terms of average inflow concentrations adjusts for differences in hydrologic conditions (e.g., wet, dry, average years). The relatively narrow range of watershed inflow concentrations (46 to 64 ppb) suggests that these estimates are relatively well-defined. Under current watershed conditions (1992-2000), estimates range from 55 to 63 ppb. Under undeveloped conditions, inflow concentration estimates range from 46 ppb (this study) to 52 ppb (MINLEAP, Heiskary et al, 1994; Wilson & Walker, 1989). The former is based upon the watershed model developed below using Mille Lacs tributary data collected in 2000. The latter is based upon the average phosphorus concentration in "minimally impacted" streams in the Northern Lakes & Forest Region of Minnesota

(Wilson & Walker, 1989). One reason for the (relatively small) difference in these estimates is that MINLEAP does not account for phosphorus trapping in smaller lakes upstream in the Mille Lacs watershed. Relatively small increases in watershed flow and phosphorus load projected under future development and highway scenarios are discussed below.

Despite the relatively high uncertainty associated with atmospheric inputs, septic tank inputs, groundwater, and other diffuse inputs, the relative impacts of alternative watershed development and point-source scenarios can be evaluated with a fair degree of certainty. This follows from the form of the model used to predict lake P concentration:

$$C = (L_W + L_X) / (Q_N + U A)$$

C = lake P concentration (ppb)
L_W = watershed & point source load component (kg/yr)
L_X = other (relatively uncertain) load components (kg/yr)
Q_N = net inflow = inflow + precip – evap = outflow + storage increase (hm^3/yr)
A = lake surface area (km^2)
U = effective settling velocity, calibrated to monitoring data (m/yr)

Once the model is calibrated, the predicted concentration for a given load depends only on the measured quantities Q_N and A. Between April and November 2000 (a dry period), the measured outflow volume was 69 hm^3 (cubic hectometers = million cubic meters) and the storage increase was -102 hm^3 (elevation change = -.19 m over 537 km^2), so that the net inflow volume was negative. In an average rainfall year, the net inflow is estimated to be 98 hm^3/yr (Table 1). Based upon calibration to Year 2000 data, the retention term of the denominator is ~912 hm^3/yr ($U A \sim 1.7$ m/yr x 537 km^2). Thus, retention is much larger than flushing as a removal term in the mass balance and predictions of lake phosphorus concentration are relatively insensitive to the water budget and to potential errors in the relatively large and uncertain precipitation and evaporation components (Table 1).

The change in concentration resulting from a change in watershed load is given by:

$$\Delta C = \Delta L_W / (Q_N + U A)$$

The uncertain load component (L_U) does not occur in the above equation, so that predicted changes in concentration will be independent of errors in the L_U estimate. There is a second-order dependence on L_U to the extent that it influences the calibration of the model (estimate of U). As demonstrated below, changes in runoff volume and phosphorus export associated with urban development (components of L_W) can be predicted using generalized model formulations and parameter estimates that have been calibrated to regional data and are widely used for planning and design purposes in Minnesota (Schueler, 1987; MPCA, 2000; Walker, 1987).

The nonpoint watershed load to Mille Lacs Lake reflects contributions from a variety of land uses in the basin, adjusted for phosphorus trapping in upstream lakes. Recent land uses in the basin have been classified as 61% forest, 7% water, 5% marsh, 15 % pasture, 4% cultivated, and 7% urban, excluding Mille Lacs Lake surface (Heiskary et al., 1994). The following evaluation of highway impacts uses a simpler classification system for the existing watershed (4.7% lake, 93.7% pervious, 1.6% impervious, excluding Mille Lacs surface), based upon data provided by S.E.H.. For purposes of the analysis, background loads from pervious surfaces is assumed to reflect the net contributions from undeveloped and agricultural land uses. This system is appropriate for the purposes of this report, since changes in phosphorus loading resulting from highway construction and associated urban development can be conveniently estimated based upon corresponding changes in impervious surface area using the models described below.

Model Development

Highway water-quality impacts are evaluated using an expanded version of the PondNet, software designed for developing water & pollutant mass balances in complex

watersheds consisting of interconnected streams, ponds, and lakes (Walker, 1989). The model is calibrated to monitoring data collected in Mille Lacs Lake and its tributaries during 2000 and to other regional sources of data on runoff quantity and quality. Potential modes of impact associated with highway development are primarily related to increases in impervious area and associated surface runoff resulting from highway construction and adjacent land development. Secondary modes of impact include chemical application (deicing salts) and loadings from traffic-related contaminants. It is assumed that future construction associated with each highway alternative and urban development in general will not encroach upon existing waterbodies or wetlands in the watershed.

Model Segmentation

The model region (Figure 4) consists of 1705 km^2 divided into 39 subwatersheds or segments. Segment characteristics derived from GIS databases are summarized in Table 2. The area consists of Mille Lacs Lake (697 km^2), Mille Lacs watershed (379 km^2), segments draining into the Rum River downstream of Mille Lacs (259 km^2), and segments draining west to the Mississippi River (370 km^2). The segment linkage, or flow path, is illustrated in Figure 5.

Highway alternatives are overlaid on the model region in Figure 6. A total of 769 km^2 are impacted directly or indirectly by the highway project, 140 km^2 of which are in the Mille Lacs watershed. Direct impacts would be associated with the highway itself; indirect impacts would be associated with changes in land use resulting from the highway. The remainder of the model region consists of Mille Lacs Lake itself (379 km^2) and Mille Lacs eastern watersheds (240 km^2). The latter have been included to provide a complete representation of the Mille Lacs watershed. Three artificial segments have been created to reflect the combined outflow to the Mississippi River, Rum River, and the total model region.

PondNet develops water and pollutant mass balances, accounting for pollutant retention in lakes potentially located in each segment. The total area of lake surface has been computed for each segment (Table 2). The model region contains a total of 73 km^2 of lake surface, exclusive of Mille Lacs (379 km^2). The model drainage network captures the essence, if not the details, of the actual flow paths. The segments are defined so that major lakes are generally located at the downstream ends (pour-points) of segments (Figure 4). Some segments contain no lakes and/or small lakes distributed throughout the subwatershed. The model estimates the total flow and pollutant load leaving each segment (in a stream or a lake outflow).

Ground-watersheds and surface-watersheds are assumed to be identical. Differences would have small effects on the pollutant mass balances because most of the pollutant load is generated in surface runoff. It is assumed that groundwater flow (baseflow) is intercepted by the streams and/or lakes in each segment. To the extent that groundwater flows move to the next downstream segment without being intercepted, reductions in runoff loads within local lakes may be under-estimated because lake flushing rates would be over-estimated.

Spatially distributed estimates of impervious area and road parameters (surface area, lengths, traffic densities) associated with existing and future land uses have been provided by S.E.H. for each alternative (Tables 3-6). Within project-area watersheds, increases in road surface area associated with various alternatives range from 16% to 51%, relative to the existing road surface area of 185 ha. Based upon S.E.H. estimates, future growth in the region will result in a 24% increase in the existing impervious area (1,128 ha). The alternatives influence the spatial distribution of this growth (Table 3). For purposes of the analysis, increases in impervious area associated with urban development are assumed to be exclusive of increases in road surface. Therefore, the analysis is likely to be conservative (over-estimate impacts), depending upon the extent to which road surfaces are already included in the urban impervious estimates provided by S.E.H.. To evaluate sensitivity to the growth projections, additional model runs are

performed assuming a 48% increase in impervious area (i.e., doubling the impervious area increase in each subwatershed).

Estimates of road parameters and future impervious areas for non-project watersheds (eastern Mille Lacs) were not provided by S.E.H. A 24% increase in impervious area (identical to the S.E.H. estimate for project watersheds) is assumed. Road parameters have been estimated by applying scale factors to existing impervious areas. Scale factors (e.g., hectare of road surface per hectare of impervious area) have been computed from the combined project-area watersheds under existing conditions. The above assumptions regarding non-project watersheds have small effects on projections of future pollutant loads from these watersheds, but do not influence the comparisons of the highway alternatives.

Water and Mass Balance Equations

The equations used to develop steady-state water and mass balances for each segment and alternative are described below. Model coefficients requiring independent estimation or calibration are underlined. The remaining terms are directly measured, derived from GIS databases, or computed from other terms. Data sources and parameter estimates are summarized in Table 7.

Total discharge from the land area in each segment (exclusive of lake surfaces) is computed as a function of impervious area using a regionally calibrated version of the "Simple Method" (Schuler (1987); MPCA, 2000):

$$WatershedOutflow = Runoff + Baseflow$$

$$Runoff = ImpervRunoff + PervRunoff$$

$$ET = ImpervET + PervET$$

Baseflow = Precipitation – Runoff – ET

ImpervRunoff = ImpervArea x ImpervRunoffCoef x Precip

ImpervET = ImpervArea x (1 – ImpervRunoffCoef) x PervETCoef

PervRunoff = PervArea x PervRunoffCoef x Precipitation

PervET = PervArea x PervETCoef

A steady-state water balance is developed for each segment using the following equations:

Inflow = TotalRunoff + TotalBaseflow + LakePrecip + WastewaterFlow
+ Inflow from Upstream Segment

Outflow = Inflow - LakeEvaporation

For each water quality component, the load from each subwatershed is computed from the following equations:

WatershedLoad = RunoffLoad + BaseflowLoad + TrafficLoad + AppliedLoad

Runoff Load = ImpervRunoffLoad + PervRunoffLoad

ImpervRunoffLoad = ImpervRunoff x ImpervRunoffConc

PervRunoffLoad = PervRunoff x PervRunoffConc

BaseflowLoad = Baseflow x BaseflowConc

TrafficLoad = TrafficDensity x TrafficLoadingFactor

AppliedLoad = ApplicationRate x RoadLaneLength

The traffic term is included for routing a hypothetical contaminant with load dependent on traffic density. It also serves as a surrogate for impacts relating to accidental spills, assuming that risk of spill is proportional to traffic density. The applied load is used for modeling road salt applications and serves as a surrogate for any conservative substance originating on road surfaces.

Given the above load estimate for local inflows, the mass balance on the lake at the downstream end of each segment is formulated using the following equations:

InflowLoad = WatershedLoad + AtmosLoad + PointSourceLoad + SepticTankLoad + LoadfromUpstreamWatershed

AtmospLoad = LakeArea x AtmosDeposition Rate

OutflowConc = InflowLoad / (Outflow + SettlingVeloc x LakeArea)

OutflowLoad = Outflow x OutflowConc

Retention = InflowLoad – OutflowLoad

For the purpose of predicting outflow concentration and load, the model treats each lake as mixed reactor (one stirred tank). The retention term is zero in segments without lakes. A variety of empirical models are available for estimating the retention term for phosphorus in lakes. The settling velocity model (Vollenweider, 1969; Chapra, 1975) is used here because it does not require an estimate of depth and there is limited information on the depths of many lakes in the watershed. Given that the rates are calibrated to local data (vs. literature values) and given the relatively small changes in phosphorus

concentrations projected to result from the various alternatives, results are expected to be insensitive to the choice of phosphorus retention model. Empirical models calibrated to data from other lakes would be of limited application to Mille Lacs because of its low surface overflow rate (< 0.5 m/yr), which is outside of the range of most datasets used for calibrating such empirical models, including the EPA National Eutrophication Survey and Corps of Engineer Reservoir datasets (Walker,1985a;1996). Therefore, calibration of the retention model (settling rate) to lake-specific data is essential in this case.

Model Calibration

Model input variables & calibrated parameters are listed in Table 7. Values are derived from (a) regional measurements (precipitation, evaporation, evapotranspiration); (b) previous modeling studies (runoff coefficients, runoff water quality); and/or (c) calibration to monitoring data from Mille Lacs Lake and its tributaries (pervious runoff concentration, baseflow concentration, settling rates).

Long-term precipitation and runoff records from the Rum River are displayed in Figure 7. Corresponding Mille Lacs surface water elevations are displayed in Figure 8. The annual rainfall in 2000 was 58 cm, as compared with a mean of 70 cm for 1929-2000. Rum River runoff was 8 cm, as compared with a mean of 15 cm for 1929-2000 (period of record for the Rum River flow gauge). Precipitation and runoff in 2000 were in the 16th and 23rd percentiles of annual values in the 1929-2000 historical record, respectively. The lake elevation dropped by 0.19 m during the April-November 2000 monitoring period. As discussed above, the sum of the lake outflow and change in storage during this period (equivalent to the net inflow) was negative during this period. The difference between precipitation and runoff estimates the average evapotranspiration rate for the watershed (50 cm in 2000, 55 cm average). These precipitation and evapotranspiration rates are used in modeling runoff from Hwy 169 project area watersheds. The long-term average precipitation (70 cm) is used to generate runoff flows & loads for the highway

impact analysis. Sensitivity to wet year conditions (90^{th} percentile = 87 cm) is also evaluated.

GIS databases supplied by S.E.H. provide estimates of impervious areas associated with development and road surfaces for each alternative. The impervious area runoff concentration for total phosphorus is set at the PondNet default value (650 ppb), which was derived from urban runoff data collected in the Twin Cities area (Walker, 1987; 1989) and is generally consistent with other regional datasets (MPCA, 2000). The total suspended solids concentration in impervious runoff is set at the median value reported for urban watersheds (200 ppm) under the EPA's Nationwide Urban Runoff Program (Athayde et al., 1983) and used as the default value in the P8 model (Walker, 1990). Data collected by the USGS at 5 road sites in the St. Paul area indicate that flow-weighted-mean phosphorus and suspended solids concentrations in road runoff are not significantly different from the above values typical of regional urban runoff in general (Figures 9 & 10). Barrett et al (1995) reached a similar conclusion for wider array of contaminants, based upon studies of highway runoff in Texas.

It is likely that the above typical urban runoff concentrations over-estimate the actual concentrations in runoff from a four-lane highways with high-speed traffic. During dry periods, air movements associated with vehicle traffic can transport contaminant particles to adjacent grassed areas and other pervious surfaces (Barrett et al., 1995). This process essentially provides a sweeping function that removes contaminants that would otherwise be transported in runoff from the road surface. Contaminants deposited in pervious areas would be less susceptible to transport in surface runoff. The effect would not be significant, however, if deposition occurs directly on water bodies adjacent to the highway (a common situation in this case). Diversion of drainage to vegetated areas (e.g., swales or sheet flow in median strips and/or areas adjacent to the highway) would also reduce contaminant concentrations. For these reasons, assuming typical urban runoff concentrations is likely to provide conservative projections of highway impact. Figure 11 compares observed and predicted runoff flows and loads from Mille Lacs tributaries in 2000. Runoff volumes measured from April to November of 2000 are

assumed to reflect the entire year. For most tributaries, there is reasonable agreement between observed and predicted flows ($r^2 = 0.54$) using hydrologic coefficients developed independently of the Mille Lacs dataset . The unit runoff from the Thaines Creek watershed (0.59 m) was found to be significantly higher than values for other monitored tributaries (0.11-0.17 m). It is possible that this additional flow reflects a groundwater discharge to Thaines Creek or Upper Malone Creek (which drains into Thaines). An additional baseflow component is added to Thaines watershed to account for the discrepancy.

The stream baseflow concentration (40 ppb) has been set at the lower 25^{th} percentile of measured phosphorus concentrations in streams without significant upstream lakes. The pervious area runoff concentration has been adjusted to promote agreement between observed & predicted tributary phosphorus loads and concentrations in Year 2000 (Figure 11). Phosphorus concentrations in monitored tributaries along the west shore of the Lake (Holt, Borden, Whitefish) are more heavily influenced by retention in upstream lakes, as compared with tributaries along the eastern shore (Peterson, Seventeen, Ditch 36, Cedar, Figure 4). The phosphorus settling rate (3 m/yr) for upstream lakes has been adjusted to match observed concentrations at the mouths of tributaries along the western shore. Excluding Thaines Creek, the calibrated model explains 86% and 93% of the tributary phosphorus loads and concentrations, respectively.

The calibrated watershed loading model can be used to predict increases in runoff volume, load, and concentration expected to result from increasing urban development. Figure 12 shows predicted responses as a function of percent urban land use for assumed urban impervious fractions ranging from 10% to 70%. Model predictions are compared with the ranges of observed data from the Twin Cities area reported by Walker (1985b). Results indicate that the calibration is consistent with other regional data (Figure 12), as well as with data from Mille Lacs tributaries (Figure 11).

Using the watershed loading model calibrated to Year 2000 data, the phosphorus settling rate for Mille Lacs (1.7 m/yr) has been adjusted to simulate the lake-mean phosphorus

concentration observed in June-August of that year (17 ppb). Given the long water residence time in Mille Lacs (~35 years based upon the average-year water budget in Table 1), it is likely that the lake phosphorus concentration measured in 2000 was not in equilibrium with the loads experienced in that particular year. With the watershed model adjusted to an average rainfall year (0.70 m vs. 0.58 m for 2000), the calibrated settling rate for Mille Lacs changes by less than 0.1 m/yr.

The 1.7 m/yr settling rate estimate is low relative to values reported for other (generally deeper) northern lakes (10–16 m/yr Vollenweider, 1969; Chapra ,1975). Low values have also been recently reported, however, for other large, shallow, and wind-swept lakes: (a) Lake Okeechobee, Florida (~1.0 m/yr, Walker, 2000) & (b) Upper Klamath Lake, Oregon (~0.5 m/yr, Walker, 2001). High rates of phosphorus recycling from bottom sediments may be responsible for the relatively low settling rates characteristic of these shallow systems.

Results

The following 11 scenarios have been run for existing conditions and each highway alternative shown in Figure 6 (No-Build, Alt-2, Alt-2A, Alt-3, Alt-4, and Alt-5):

Total Phosphorus (Settling Rates = 3 m/yr, 1.7 m/yr in Mille Lacs)

1 Average Year (Rainfall = 0.7 m/yr)

2 Wet Year (90^{th} Percentile Rainfall = 0.87 m/yr)

3 Avg. Year, No Lake Phosphorus Retention (except in Mille Lacs)

4 Avg. Year, With BMP's Applied to New Roads (60% reduction)

5 Avg. Year, With BMP's Applied to New Roads & Urban Dev. (60% reduction)

Total Suspended Solids (Settling Rates = 80 m/yr, 40 m/yr in Mille Lacs)

6 Average Year

7 Wet Year

Road Salt (Applied at Rate of 3.9 Mtons/lane-km-yr, Settling Rate = 0 m/yr)

8 Average Year

9 Wet Year

Traffic Contaminant (0.1 unit / car-km; Settling Rates = 40 m/yr, 20 m/yr in Mille Lacs)

10 Average Year

11 Wet Year

Simulation of an average rainfall year provides the base case for each water quality component (Cases 1, 6, 8, and 10). Sensitivity to rainfall (90^{th} percentile year, Figure 7) is evaluated in Cases 2, 7, 9, 11). Additional sensitivity analyses are performed for phosphorus (Cases 3-5). Case 3 assumes no phosphorus removal in all lakes except Mille Lacs; this illustrates the extent to which loads to Mille Lacs depend upon phosphorus retention in upstream lakes. Case 4 assumes that BMP's are applied to new road surfaces with a phosphorus reduction of 60%, a level of reduction that is generally achievable with detention ponds (Walker, 1987) or appropriate combinations of other BMP's (Schueler, 1987; MPCA, 2000). Case 5 assumes that BMP's are applied to new road surfaces and new urban development. Effects of BMP's are simulated by reducing the impervious-area runoff concentration. No BMP's are assumed for existing impervious areas or roads.

The settling rate assumed for total suspended solids (Cases 6 & 7) in upper watershed lakes (80 m/yr) is equivalent to the 10^{th} percentile velocity in typical urban runoff (Athayede et al, 1983; Walker, 1990). This rate is reduced by 50% in Mille Lacs (consistent with the lower phosphorus settling rate found above for Mille Lacs). Since more 90% of the particles in urban runoff would be expected to have settling rates higher than 80 m/yr, simulation results for suspended solids are likely to be conservative (over-estimate actual impacts).

Road salt (Cases 8 & 9) is assumed to be applied uniformly to all roads at a rate of 3.9 mtons/lane-km-yr. This rate is based upon average statewide application rates provided by MDOT (200,000 Tons applied to 28,996 lane-miles). Road salt is assumed to be

conservative (settling rate = 0 m/yr). In addition to providing an approximate estimate of increases in salinity, road salt serves as a surrogate for any conservative substance originating on road surfaces.

Cases 10 & 11 consider a hypothetical contaminant with load dependent on traffic density. It also provides a surrogate for susceptibility to impacts relating to spills, assuming that risk of a spill is proportional to traffic density. Traffic density (vehicle-kilometers/day) is the product of average daily traffic (vehicles per day) and road length (km) summed over all road segments in each subwatershed. The traffic load factor has an arbitrary value because this component is not intended to reflect a particular contaminant. Given that traffic-related contaminants (e.g., trace metals) are typically in particulate form, settling rates equal to 50% of those used in modeling TSS are used. These assumed values are also likely to cause over-prediction of actual contaminant transport.

Detailed results are listed in the following appendices:

A Segment Mass Balances for Existing Conditions
B Mass Balance Summaries for Existing Conditions
C Concentration Increases Relative to Existing Conditions
D Displays of Concentration Increases Relative to Existing Conditions
E Segment Phosphorus Balances for Each Alternative

Table 9 summarizes overall impacts on outflows from the model region to the Mississippi and Rum River basins. Table 10 summarizes overall impacts on Mille Lacs Lake. These tables list simulated concentrations and loads under existing conditions and percentage changes under each highway alternative.

Discussion

Review of the summary tables (9 and 10) and graphs (Appendix E) suggests that the overall scale of impacts is low on a regional basis. For phosphorus and suspended solids,

regional concentration or load increases related to highway alternatives are generally smaller than increases related to future urban development. This reflects the fact that increases in road surface attributed to the alternatives (29-94 ha within the project area, Table 4) are smaller than increases in urban impervious area (~270 ha for each alternative, Table 3). For road salt and traffic contaminants, impacts are directly related to highway parameters and independent of increases in urban impervious area.

Compared with Mille Lacs, some inland lakes (e.g., Jack Pine, Rock, Whitefish, Borden) exhibit a greater sensitivity to highway alternative. This reflects the fact that new roads and/or impervious surfaces created under specific alternative would constitute greater proportions of the existing watersheds.

Phosphorus

Percentage increases in Mille Lacs Lake phosphorus concentrations and loads relative to existing conditions are summarized below, as extracted from Table 10:

Case	Concentration	External Load	NonPoint Load	Conc*
Average Year	0.2 to 0.7%	0.9 to 2.0%	1.9 to 3.6%	0.6 to 1.4%
Wet Year	0.4 to 0.9%	1.0 to 2.2%	1.9 to 3.3%	1.0 to 1.9%
No Upstream Retention	0.9 to 1.3%	2.3 to 3.3%	3.6 to 4.9%	1.9 to 2.7%
Road BMP's	0.2 to 0.5%	0.9 to 1.7%	1.8 to 3.2%	0.6 to 1.3%
Road & Urban BMP's	-0.1 to 0.0%	-0.1 to 0.3%	0.8 to 1.4%	0.0 to 0.3%
* concentration increase assuming 48% increase in impervious area				

External loads exclude atmospheric deposition. Nonpoint loads exclude atmospheric deposition, point sources, and septic tank discharges. It is unlikely that changes of these magnitudes would be detectable under a typical monitoring program.

Predicted increases in Mille Lacs phosphorus concentration range from 0.2% to 0.7% in an average year and 0.4 to 0.9% in a wet year (Cases 1& 2, Table 10). If phosphorus

retention in upstream lakes is ignored, concentration increases range from 0.9% to 1.3% in an average year (Case 3). With application of BMP's to new road surfaces, concentration increases range from 0.2% to 0.5% (Case 4). With application of BMP's to new roads and new urban developments, concentration increases range from –0.1% to 0.0% (Case 5).

To evaluate sensitivity to the growth projections, additional model runs have been performed assuming a 48% increase in impervious area associated with urban developments (i.e., doubling the estimates of impervious area increase in each subwatershed provided by S.E.H.). The primary effect of increasing the impervious area in a given subwatershed is to increase the unit area phosphorus load. Secondary effects include an increase in flow volume and a decrease in phosphorus trap efficiency in the intercepting pond. The net result is an approximate doubling in the phosphorus concentration increase projected for each alternative. For example, the 0.2 to 0.7% increase in Mille Lacs P concentrations predicted for an average year is 0.6 to 1.4% when a 48% increase is impervious area is assumed. With application of road & urban BMP's, the predicted phosphorus concentration increase is -0.1 to 0.0 % assuming a 24% impervious area increase vs. 0.0 to 0.3% assuming a 48% impervious area increase.

The phosphorus simulations reflect the combined effects of urban development, highway alternative, and diversion of the historical wastewater load (51 kg/yr). Other load components under existing conditions (Table 1) include atmospheric deposition (10,730 kg/yr), septic tank effluents (1,500 kg/yr) and watershed inputs (5,035 kg/yr). The combination of wastewater diversion and BMP's on new roads and impervious surfaces results in no net increase in total phosphorus load for each highway alternative. These results would be compatible with the objective of maintaining existing water quality and designated uses for the Lake. To the extent that future wastewater management will reduce inputs from septic tanks, a net reduction in total load and lake concentration would result.

Predicted phosphorus concentration increases range from 0.5 to 2.0% in the combined outflows to the Mississippi River basin and 1.1 to 2.4% in total outflow to the Rum River basin (Table 9). With application of BMP's, these ranges would be reduced to 0.1 to 0.4% and 0.4 to 1.0%, respectively. Net impacts on the Rum River segments depend upon the assumed discharge concentration for the new wastewater discharge to Ogechie Lake. Effluent from an advanced treatment facility will be further treated in a wetland before being discharged to the Lake. Given the size of the treatment wetland relative to the discharge flow, it is likely that phosphorus concentrations in the wastewater will be at wetland background levels ~(50 ppb) at the point of discharge to the Lake (Kadlec, pers. com., 2001). Uncertainty in estimates of wetland discharge concentration and flow influences the projected future phosphorus concentrations in the Rum River segments, but not the comparisons of highway alternatives.

Potential phosphorus increases in smaller lakes within the project area (e.g., Borden, Smith, Holt, Camp) are in a higher range (1 to 4 ppb), compared with those estimated for Mille Lacs (<0.1 ppb, Figure D-2). This reflects the fact that new roads and urban areas account for higher percentages of the watershed in these smaller lakes. Sensitivity is greatest for the inland alternatives (4 & 5, Figure 6), which create new highway segments and associated urban development in watersheds that are now relatively undeveloped. With application of BMP's, these increases would be limited to < 1 ppb (Figure D-6).

Total Suspended Solids

Percentage increases in Total Suspended Solids (TSS) loads to Mille Lacs Lake and in-lake concentrations range from 0.8 to 2.7% for the various alternatives (Cases 6 & 7, Table 10, Figures D-7 & 8). Increases are 2.6 to 2.7% for the highway alignments closest to the Lake (2 & 2A, Figure 6), as compared with 0.8 to 1.9% for the other alignments and 1.2% for the no-build alternative. With application of appropriate BMP's, these increases could be reduced by 80% or more (Schueler, 1987). On an absolute scale, projected TSS increases are less than 0.2 ppm for all segments & alternatives (Figure D-

7). Given that TSS detection limits are typically 1-2 ppm, the projected increases would not be detectable under normal monitoring protocols.

Road Deicing Salts

Percentage increases in road salt loads to Mille Lacs Lake and in-lake concentrations range from 17 to 32% for the various alignments (Cases 8 & 9, Table 10, Figures D-9 & 10), as compared with 0% for the no-build alternative. Differences among alternatives reflect differences in the numbers of lane-kilometers added to the Mille Lacs watershed (Table 5). On an absolute scale, salt concentration increases associated with the various alignments range from 1 to 3 ppm for Mille Lacs and 0 to 16 ppm for other segments (Figure D-9). The inland routes for the highway (alternatives 4 & 5) would generate salinity increases of 5 to 16 ppm in several of the inland lakes (e.g., Jack Pine, Rock, WhiteFish , Borden, Camp, Figure 4). The projected concentration increases appear to be in a range that is measurable relative to existing background levels. Based upon Year 2000 monitoring data, the existing chloride concentration in Mille Lacs Lake is relatively low (~ 3 ppm or ~ 5 ppm as sodium chloride).

The projections assume uniform application at a rate 3.9 mtons/lane-km-yr (Table 7) to all road surfaces in the watershed. Results would be conservative to the extent that application rates are lower than the above statewide estimate for highways. Given the seasonality of road salt applications, concentration impacts in the tributaries and smaller lakes would be focused in winter/spring and probably exceed those indicated by the annual mass balance model. Given the long water residence time in Mille Lacs, seasonal variations in salinity would not be expected.

Road salt typically consists of calcium and/or sodium chloride and is generally more of a concern for drinking water supplies than for protection of aquatic life. Depending upon road salt composition, increases in chloride, sodium, calcium, and specific conductance would be expected to result from increased road salt loadings. The potential significance of projected concentration increases for some locations and alternatives could be

evaluated based upon an inventory of the biological communities and review of available data on salinity tolerances. Alternative deicing chemicals could be substituted if salinity increases are considered to be biologically significant.

Traffic Contaminants

Percentage increases in loads of traffic-derived contaminants to Mille Lacs range from 66% to 160% for the various alternatives, as compared with 126% for the no-build alternative (Table 10). Projections reflect the overall regional increase in traffic density (independent of alternative) and the spatial distribution of traffic densities for each alternative listed in Table 6. As in the case of phosphorus and other constituents, the selection of alternative has greater relative impact on inland lakes (Figure D-11).

These simulations are intended primarily to provide qualitative indications of sensitivity to loadings of contaminants from deterioration of vehicles and/or accidents, assuming that these loadings are proportional to traffic density. It is likely that the average load per unit of traffic (i.e., kilograms per vehicle-kilometer) would be lower under each of the alternatives (except no-build) because of the associated reductions in accident frequency and reductions in braking and tire ware associated with stop-and-go traffic.

It is not possible to express these projections on absolute concentration scales or evaluate them in relation to water quality criteria or standards. With conservative estimates of settling rates, regional lakes are expected to trap 88% of the total loads of traffic-derived contaminants under existing conditions (Table B-11). Application of onsite BMP's would provide further load reductions. Traffic-derived contaminants (heavy metals, hydrocarbons) are not known to pose a particular threat under existing conditions. Compilation and analysis of historical monitoring data on these components would provide further insights.

Conclusions

1. Projected increases in concentrations of phosphorus and suspended solids in Mille Lacs Lake and in the region overall are small relative to existing levels and probably not measurable in the context of normal climate-induced variations. The potential increases are controlled more by regional urban development than by selection of a specific highway alternative.

2. Given the planned diversion of wastewater and potential implementation of Best Management Practices (BMP's) for controlling runoff from highway segments and new urban development and assuming that existing waterbodies and wetlands in the watershed are preserved, it is likely that any of the alternatives could be implemented without causing a net increase in Mille Lacs phosphorus concentration.

3. Compared with Mille Lacs, some inland lakes (e.g., Jack Pine, Rock, Whitefish, Borden) exhibit a greater sensitivity to highway alternative. This reflects the fact that new roads and associated urban developments created under specific alternatives would constitute greater proportions of the existing watersheds. With implementation of road and urban BMP's, the analysis indicates that increases in phosphorus concentration would be less than ~1 ppb, regardless of highway alternative.

4. Loadings of road deicing salts to Mille Lacs and inlake concentrations are projected to increase by 17 to 32% or 1 to 3 ppm for the various alignments. Measurable increases in concentrations of chloride and other components (sodium, calcium, conductivity) may occur. Increases would be larger in inland lakes impacted by specific alternatives, particularly in Spring. The potential significance of projected salinity increases for some locations and alternatives could be evaluated based upon an inventory of the biological communities and review of available data on salinity tolerances. Alternative deicing chemicals

could be substituted if salinity increases are considered to be biologically significant

5. Percentage increases in loads of traffic-derived contaminants to Mille Lacs range from 66% to 160% for the various alternatives, as compared with 126% for the no-build alternative. The predicted increases primarily reflect the regional increase in traffic density projected to occur, regardless of highway alternative. As in the case of phosphorus and other constituents, the selection of alternative has greater relative impact on some inland lakes. These estimates assume that loads are proportional to traffic density. Actual increases for the build alternatives are likely to be lower because the predictions do not account for reductions in accident frequency and vehicle deterioration rate (break linings, tire ware) potentially resulting from the new alignments. .

6. As measured by concentrations in the net outflows to the Mississippi and Rum River basins, overall regional water-quality impacts would be lowest for alternatives that create the least amount of additional impervious area (2 & 2A).

7. Although difficult to quantify, risk of significant water quality impacts during the construction phase would be much larger than the long-term average impacts evaluated here. Localized sedimentation & construction impacts can be minimized through prudent design of drainage systems, implementation of BMP's, and prudent construction management.

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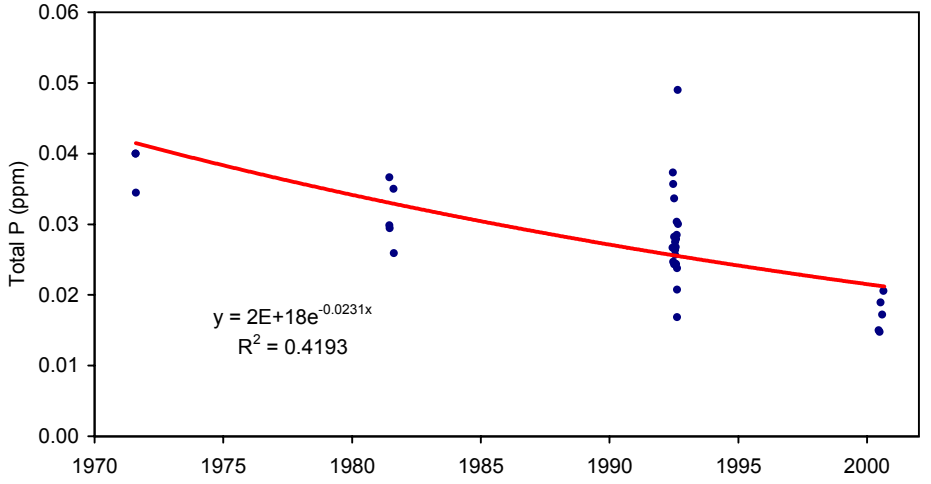
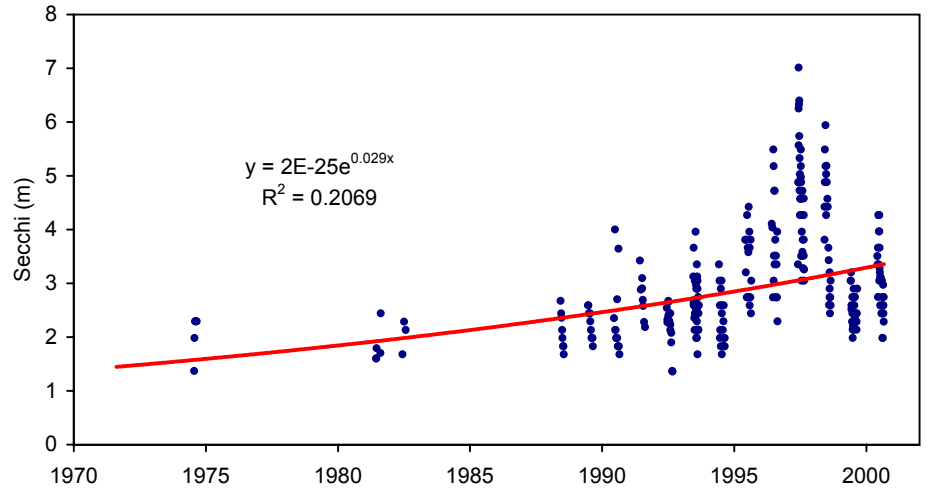
List of Figures

Figure 1
Trends in Phosphorus, Chlorophyll-a, & Secchi Depths
June-August, Lake-Mean Values





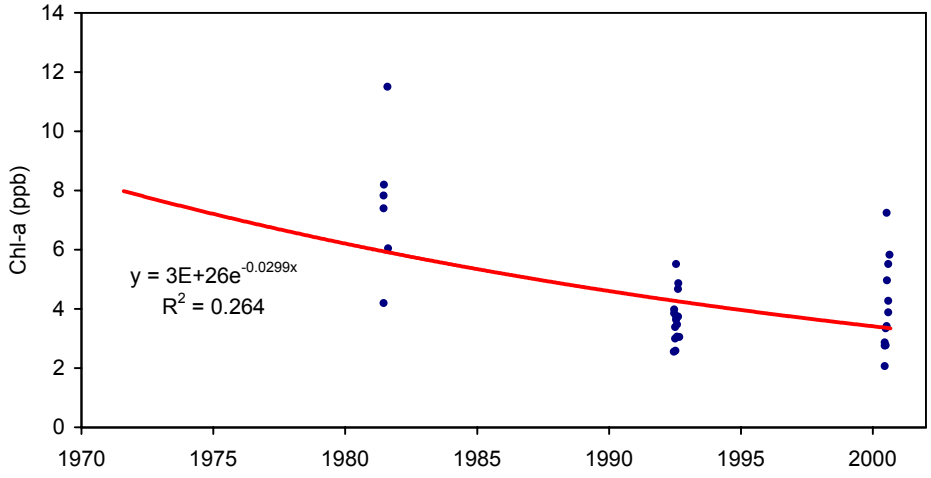
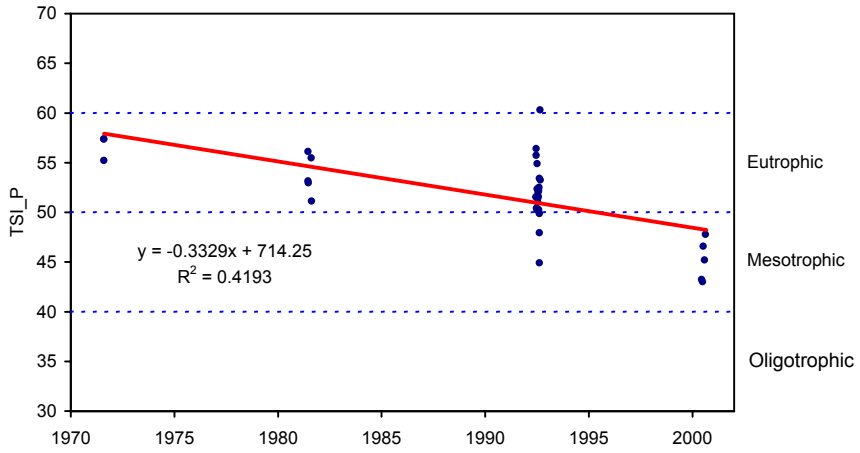
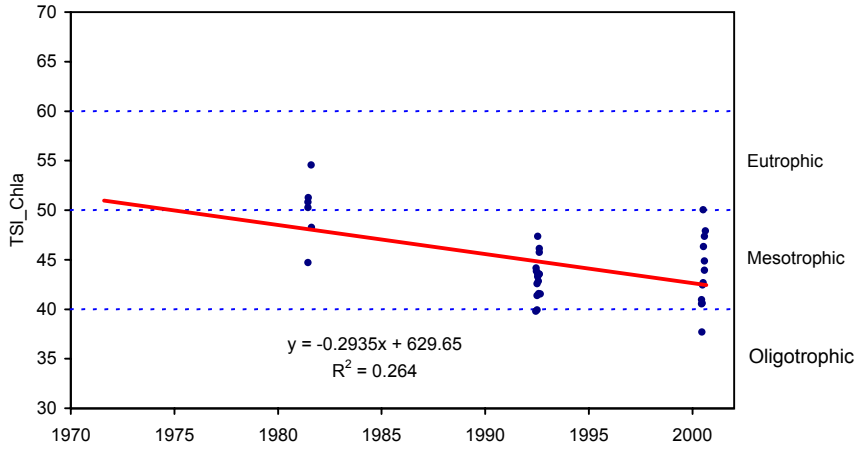
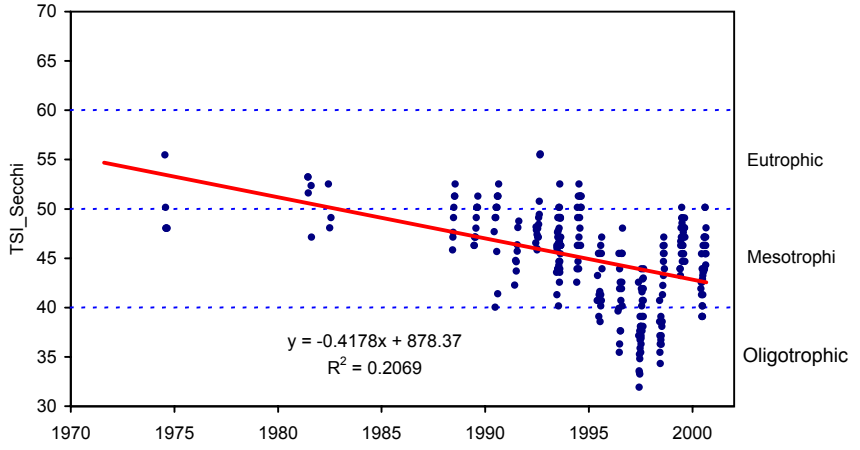


Figure 2
Trends In Trophic State Indices
June-August, Lake-Mean Values



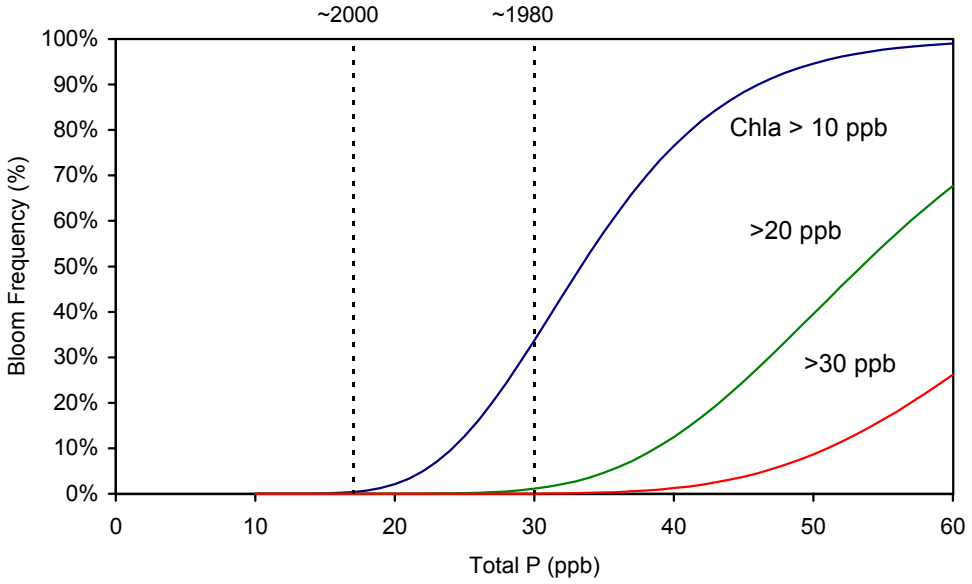


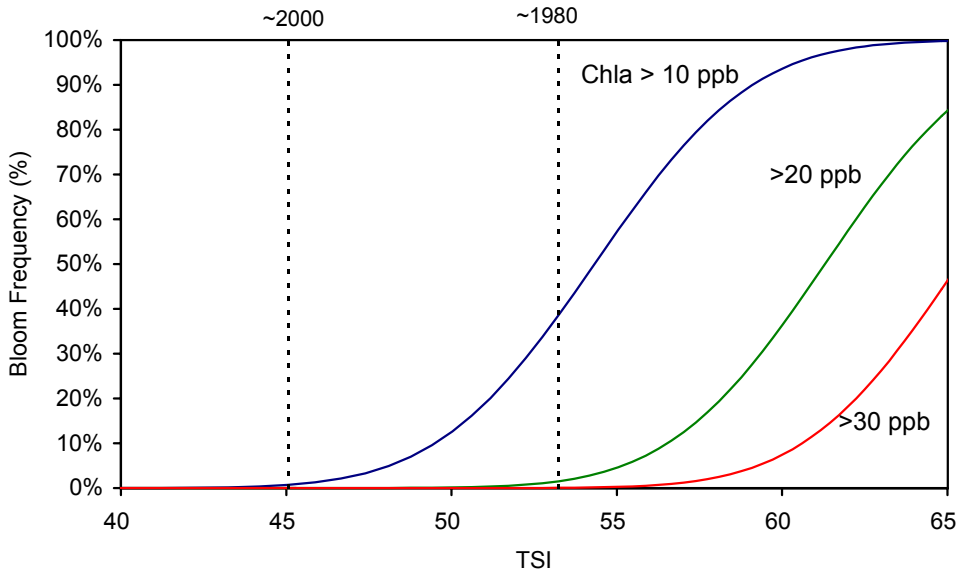


Carlson (1977) Trophic State Indices
Computed from Lake-Mean Values on Individual Sampling Dates, June-August

TSI_P =	4.2+33.2*LOG(TP, ppb)
TSI_Chla =	30.6+22.6*LOG(Chl-a, ppb)
TSI_Secchi =	60-33.2*LOG(Secchi, m)

Figure 3
Bloom Frequency Model for Mille Lacs Lake





X Axis: June-August Mean Total P & Corresponding TSI
Y Axis: Frequency of Lake-Mean Chl-a Concentrations > 10, 20, or 30 ppb

Bloom Criteria (C*):

Algae Visible	10 ppb
Nuisance	20 ppb
Severe Nuisance	30 ppb

Mean Chl-a = Cm = $0.062\ TP^{1.47}$ Carlson TSI (1997)
Freq (Chla > C*) = 1 - Normal(Z) Walker (1984)
Z = $[\ln(C^*) - \ln(Cm) + 0.5\ S^2\ ] / S$
Normal = Cumulative Normal Frequency Distribution
S = Within-Year CV of Chl-a = 0.37 Year 2000 data

Figure 4
Watershed Map & PondNet Segments

Figure 5

PondNet Routing Scheme

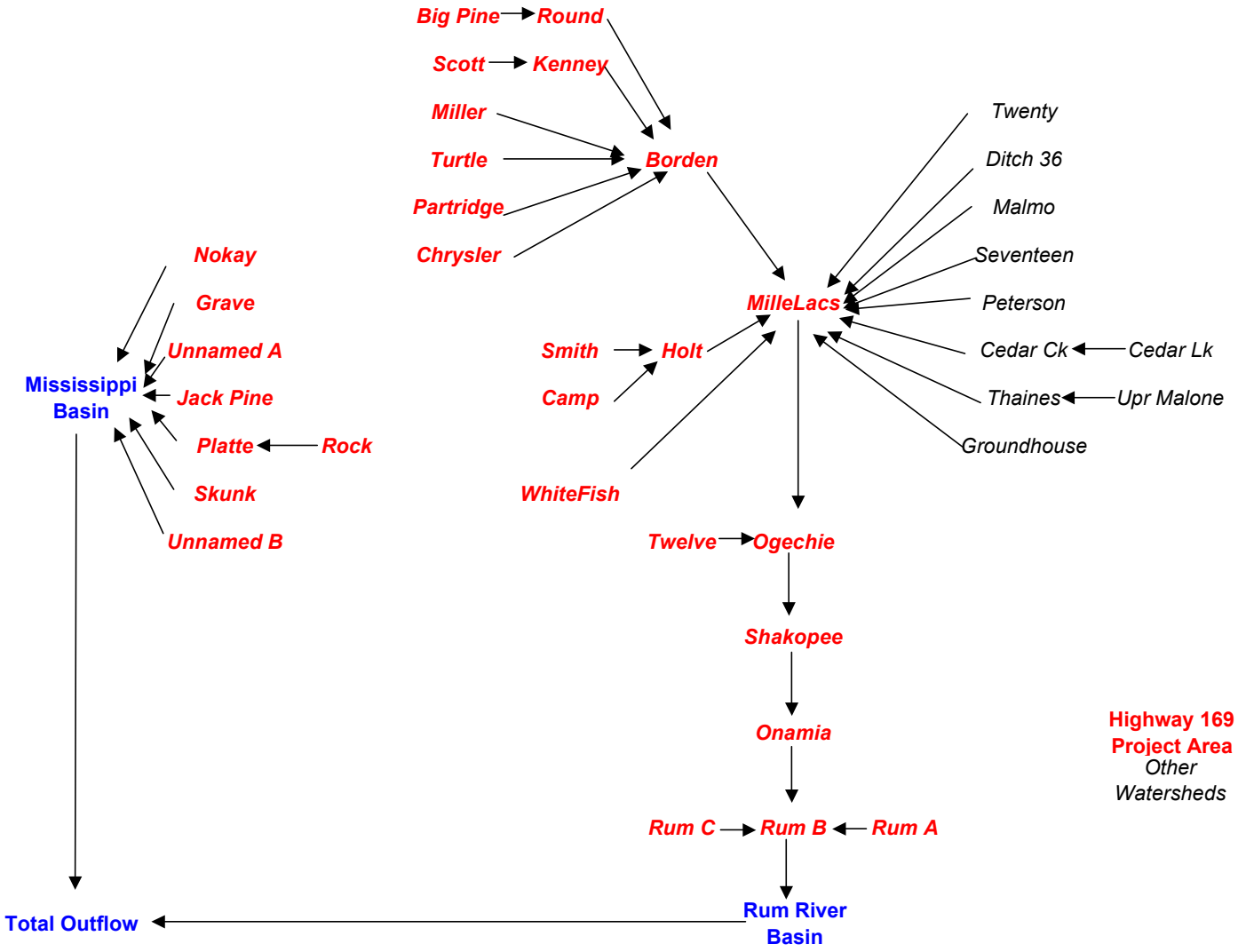
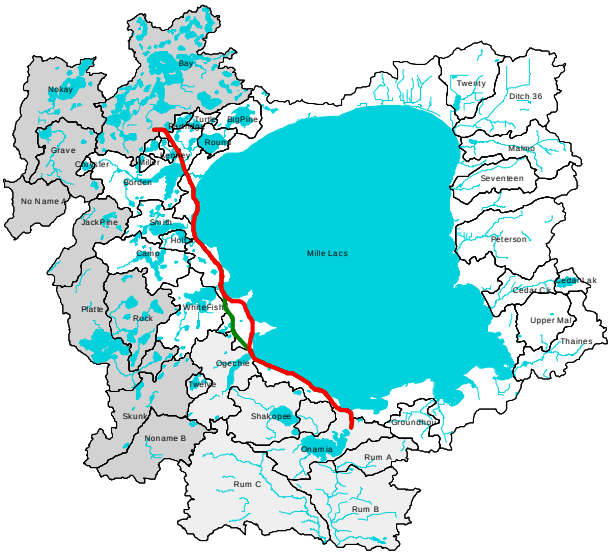
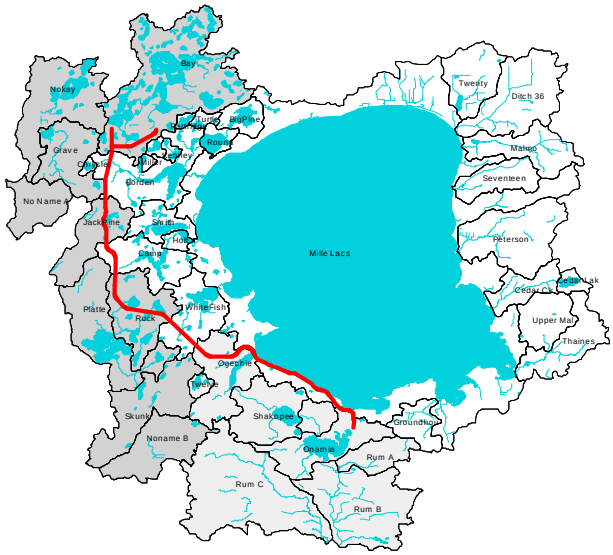


Figure 6
Alternative Highway Alignments

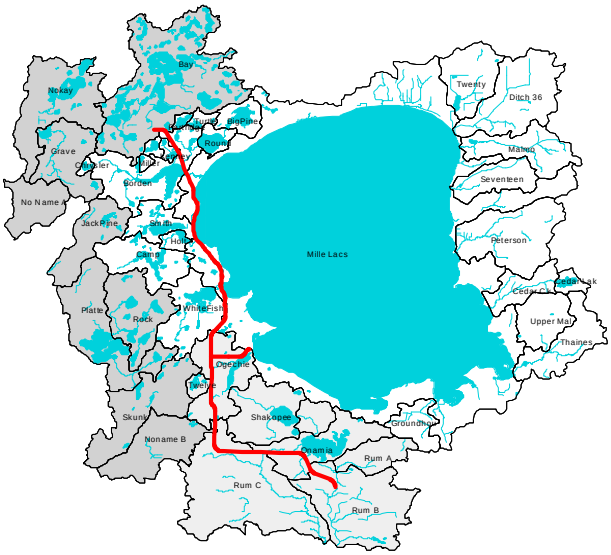
Existing Alignment & Alternatives 2 & 2A



Alternative 4



Alternative 3



Alternative 5

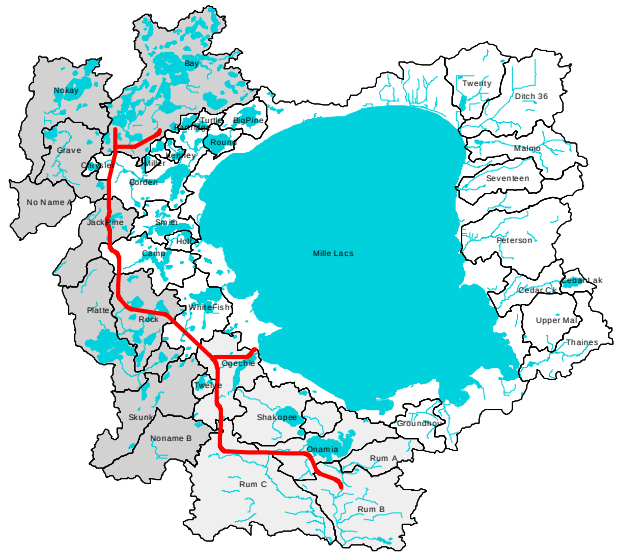
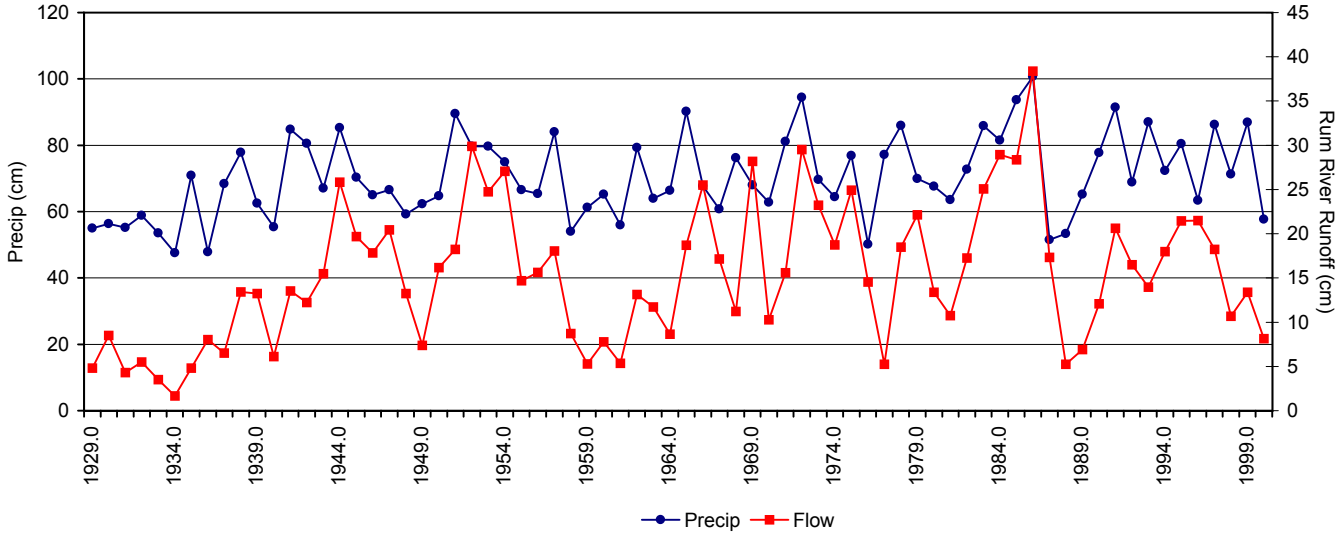
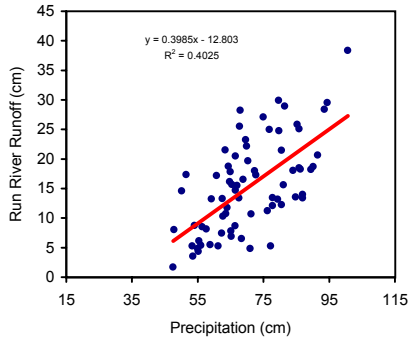


Figure 7
Long-Term Flow & Precipitation Data



Statistical Summary

	Precip cm	Runoff cm
Mean	70.5	15.3
Percentiles		
0%	47.5	1.7
10%	55.0	5.3
20%	59.5	7.8
30%	63.7	10.7
40%	65.8	13.2
50%	68.2	14.6
60%	72.0	17.2
70%	77.8	18.4
80%	81.5	21.5
90%	86.9	25.8
100%	100.7	38.4
Wyr 2000	57.7	8.1
Percentile	16%	23%



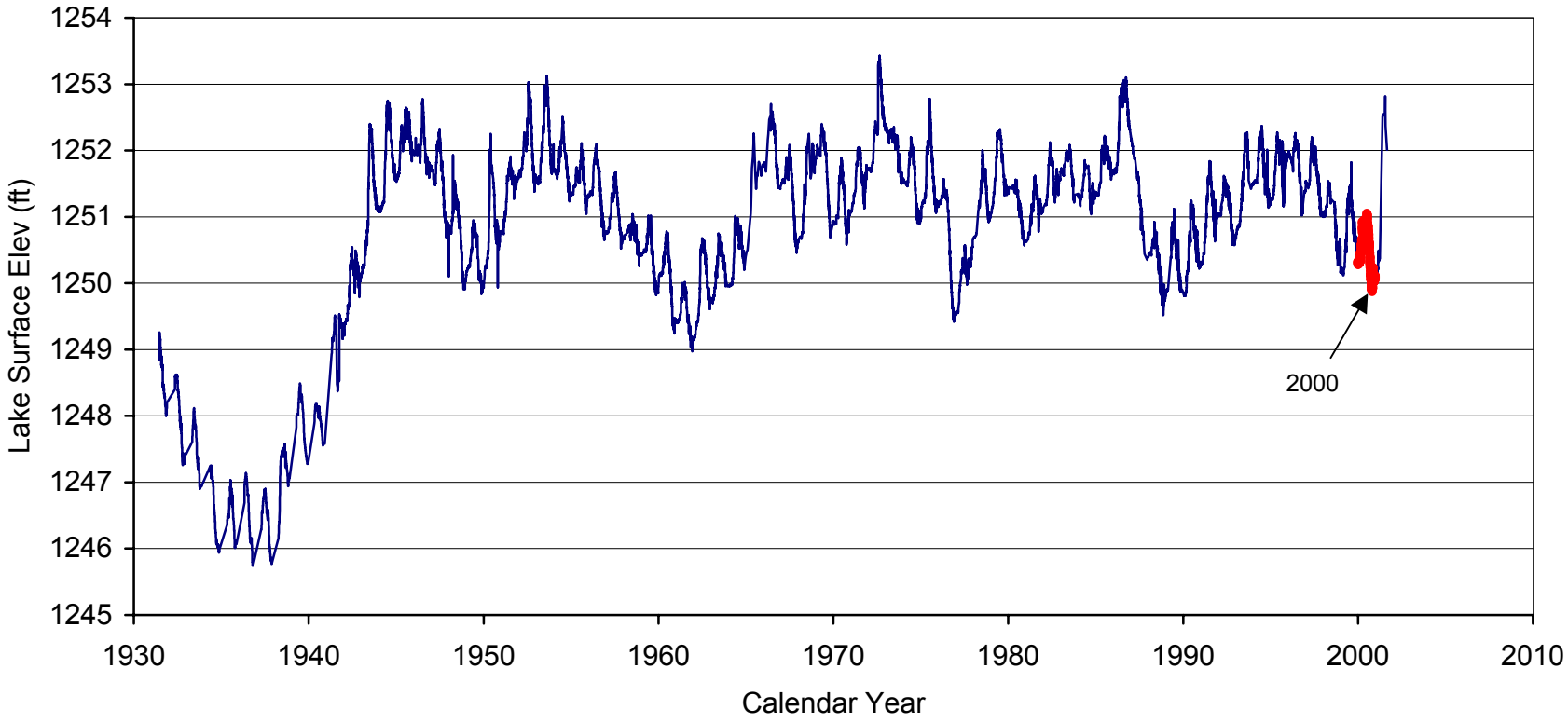
Rum River Flow at USGS Station 05286000

Site Drainage Area =	3525	km2
Mille Lacs Drainage Area =	1076	km2

Precipitation Avg of Minnesota Regions 5 & 6 (NCDC)
http://lwf.ncdc.noaa.gov/oa/climate/onlineprod/drought/statelist.html

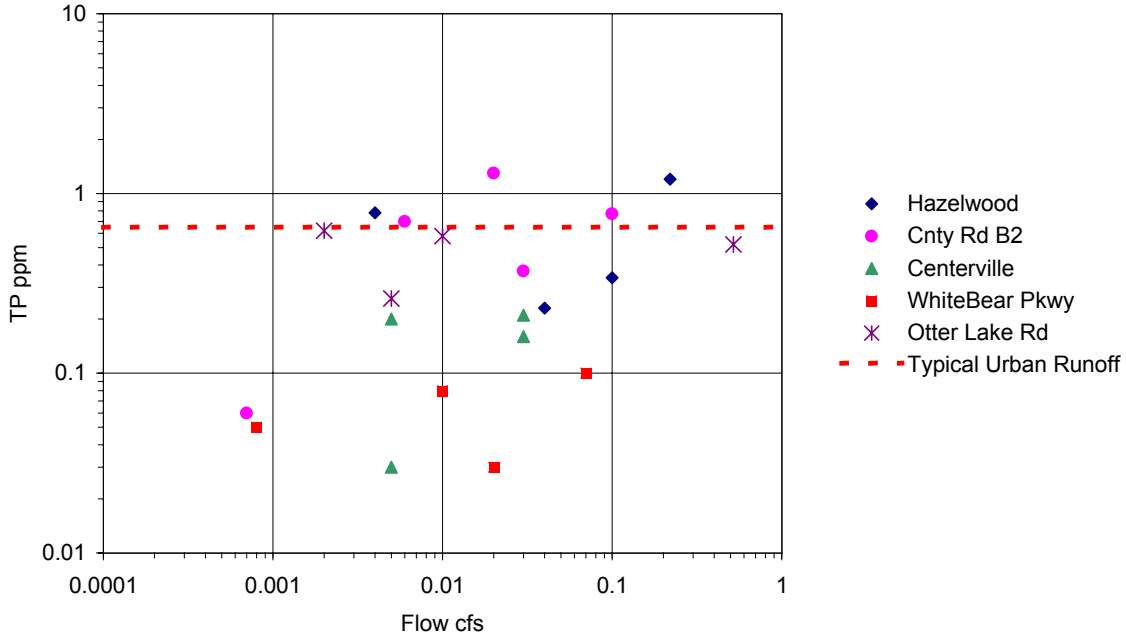
Figure 8

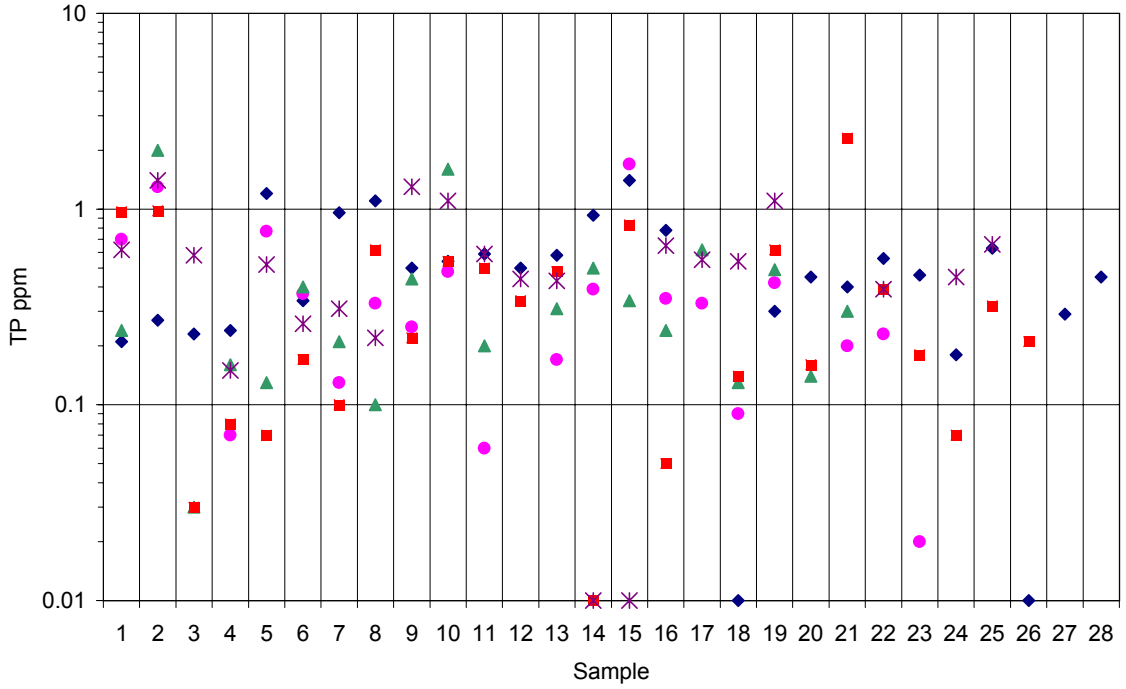
Mille Lacs Lake Daily Surface Elevations



Source: MDNR Web Site

Figure 9
Phosphorus Concentrations in Roadway Runoff, Ramsey County, Minnesota

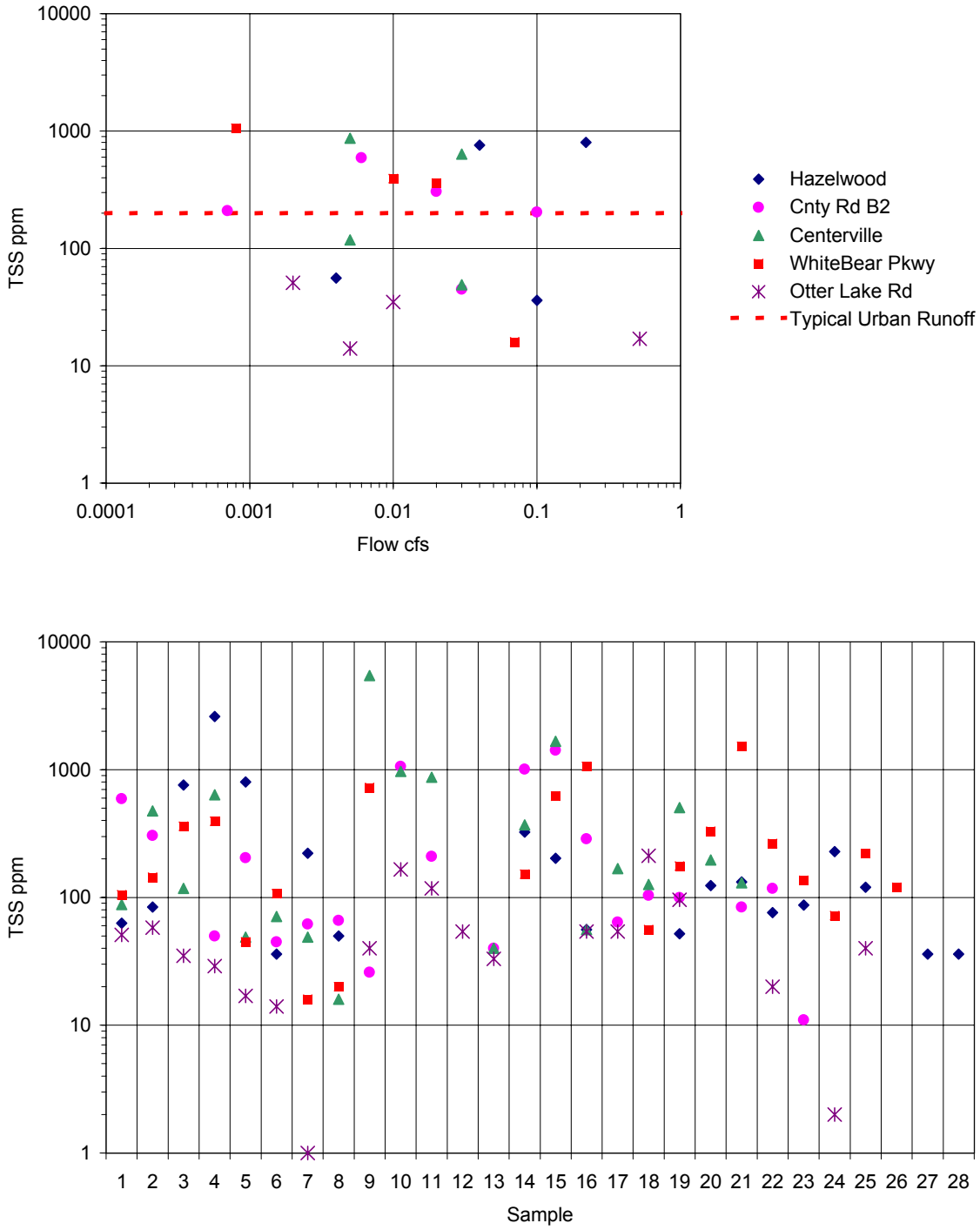




Mean	0.471 ppm
10th Percentile	0.070 ppm
50th Percentile	0.380 ppm
90th Percentile	1.064 ppm

Data Source: Mitton & Payne, 1997

Figure 10
Total Suspended Solids Concentrations in Roadway Runoff, Ramsey County, Minnesota



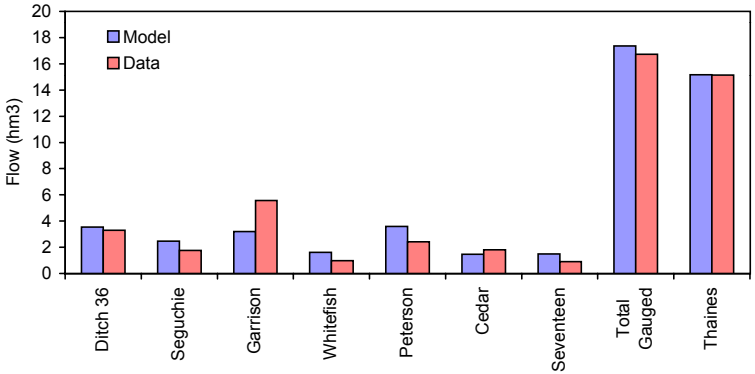
Mean	285 ppm
10th Percentile	18 ppm
50th Percentile	102 ppm
90th Percentile	789 ppm

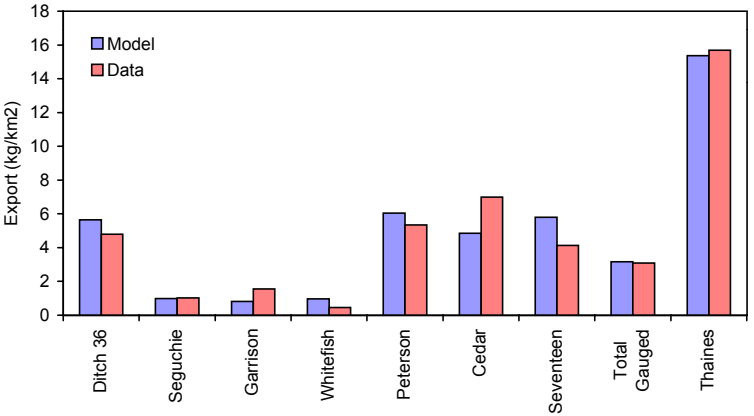
Data Source: Mitton & Payne, 1997

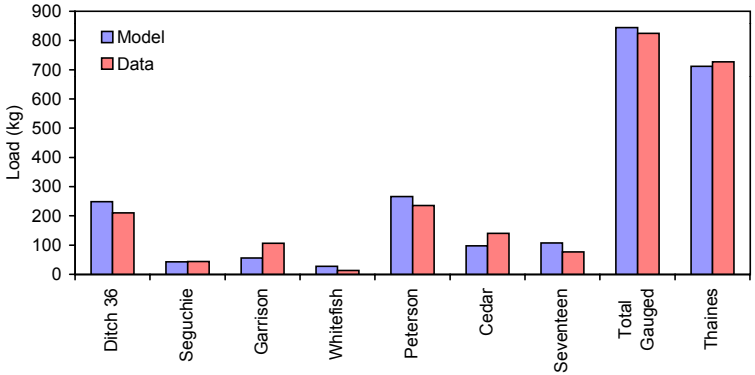
Figure 11

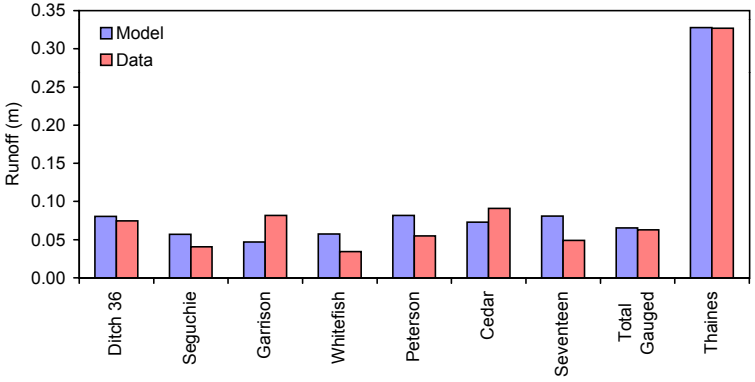
Observed & Predicted Mille Lacs Inflows

Year 2000









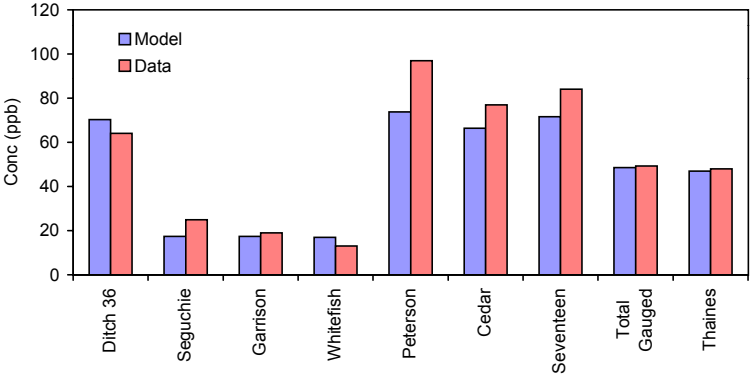
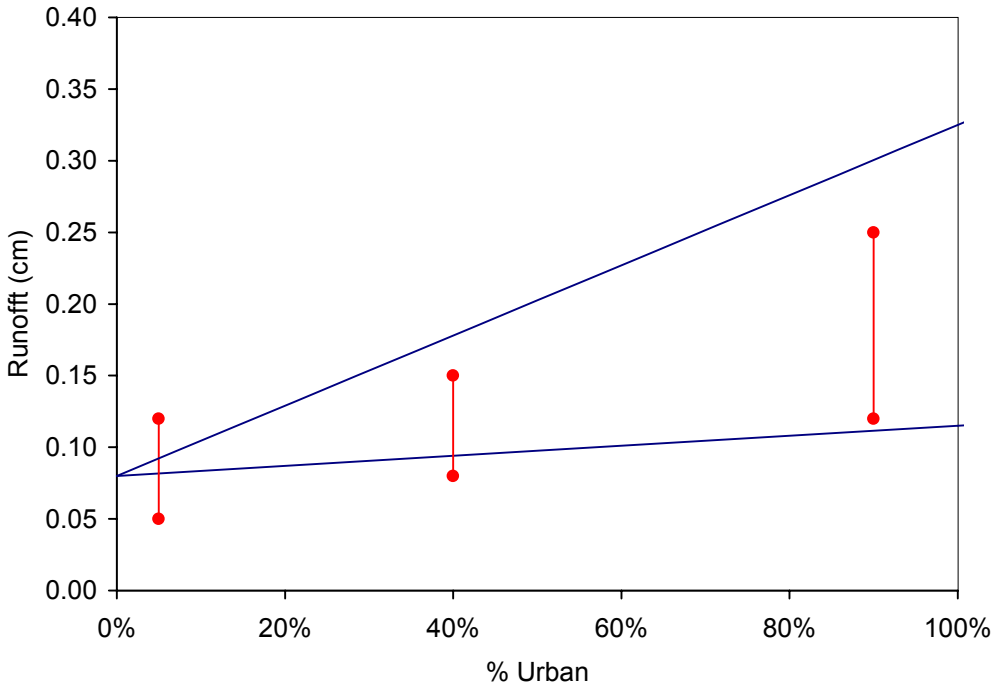
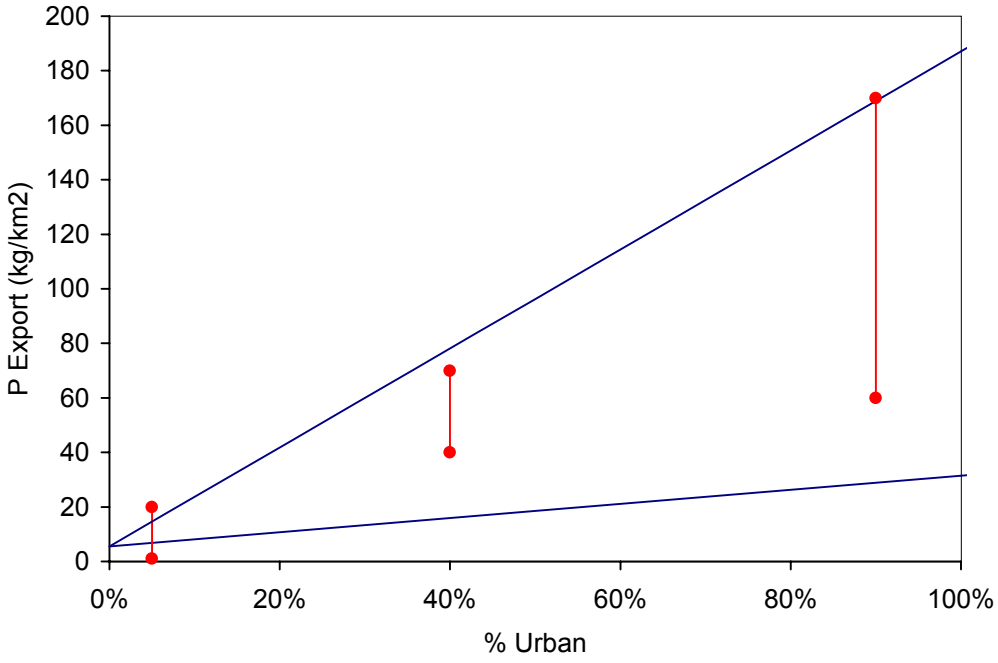


Figure 12

Runoff Model Predictions Compared with Regional Runoff & Total P Export Data





Lines show model predictions for urban impervious percentages ranging from 10% to 70%
Points show range of observed data from St. Paul Water Utility & other regional watersheds (Walker, 1985a)

List of Tables

Table 1
Alternative Water & Phosphorus Budgets for Mille Lacs Lake

Study	Units	Heiskary et al (1994), Minleap	Heiskary et al (1994)	MPCA (2001)	This Study	This Study	This Study	This Study	This Study
Watershed Condition	-	Undev.	Existing	Existing	Existing	Existing	Undev.	Fut. NoBld	Fut. Alt-2
Hydrologic Year	-	Average	1992	2000	2000	Average	Average	Average	Average
Watershed	ha	47158	47158	54342	53989	53989	53989	53989	53989
Lake	ha	53636	53636	53650	53650	53650	53650	53650	53650
Precipitation	m/yr	0.74	0.57	0.60	0.58	0.70	0.70	0.70	0.70
Lake Evaporation	m/yr	0.61	0.65	0.75	0.69	0.69	0.69	0.69	0.69
Watershed Runoff	m/yr	0.23	0.16	0.09	0.10	0.17	0.17	0.17	0.17
Watershed P Conc	ppb	52	63	63	64	55	46	55	56
Atmos P Depo	kg/km2-yr	15	50	20	20	20	20	20	20
Watershed Inflow	hm3/yr	108.5	77.2	51.4	52.9	92.2	89.1	93.0	93.2
Groundwater	hm3/yr	0.0	78.0	6.1	0.0	0.0	0.0	0.0	0.0
Point Source	hm3/yr	0.0	0.1	0.2	0.2	0.2	0.0	0.0	0.0
Septic Tanks	hm3/yr	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0
Precip	hm3/yr	396.9	305.8	321.9	311.2	375.6	375.6	375.6	375.6
Total Inflow	hm3/yr	505.4	461.1	384.5	364.2	468.0	464.6	468.6	468.8
Evaporation	hm3/yr	327.2	348.7	402.4	370.2	370.2	370.2	370.2	370.2
Net Inflow	hm3/yr	178.2	112.3	-17.9	-6.0	97.8	94.5	98.4	98.6
Watershed Load	kg/yr	5640	4862	3227	3365	5035	4138	5146	5212
Groundwater	kg/yr	0	5616	720	0	0	0	0	0
Point Source	kg/yr	0	19	51	51	51	0	0	0
Septic Tanks	kg/yr	0	0	1500	1500	1500	0	1500	1500
Winter Angling	kg/yr	0	228	0	0	0	0	0	0
Atmos Load	kg/yr	8045	26825	10730	10730	10730	10730	10730	10730
Total External Load	kg/yr	13685	37550	16228	15646	17316	14868	17376	17442
Watershed Load	%	41.2%	12.9%	19.9%	21.5%	29.1%	27.8%	29.6%	29.9%
Point Source	%	0.0%	0.0%	0.3%	0.3%	0.3%	0.0%	0.0%	0.0%
Septic Tanks	%	0.0%	0.0%	9.2%	9.6%	8.7%	0.0%	8.6%	8.6%
Atmos Load	%	58.8%	71.4%	66.1%	68.6%	62.0%	72.2%	61.8%	61.5%
Total External Load	%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 2

PondNet Segments

				Existing Watershed Areas (hectares)						
Segment Code	Basin	Name	Downstr Segment	Total	Cumul	Lakes	Roads	Imperv	Pervious	Outflow AvgYr hm3/yr
10035	Miss	Bay	1	9704.3	9704.3	2138.2	7.30	167.9	7390.9	12.24
10107	Miss	Nokay	1	4726.3	4726.3	164.6	2.78	20.3	4538.6	6.95
10109	Miss	Grave	1	2901.2	2901.2	93.3	13.47	18.0	2776.5	4.34
10110	Miss	Noname A	1	2044.8	2044.8	0.0	0.46	2.5	2041.9	3.08
10120	Miss	JackPine	1	2489.8	2489.8	43.5	5.95	3.2	2437.2	3.71
15024	Miss	Skunk	1	3965.8	3965.8	90.3	4.59	24.4	3846.5	5.93
15025	Miss	Noname B	1	3203.6	3203.6	18.8	5.88	30.0	3148.8	4.92
15056	Miss	Rock	15055	3333.0	3333.0	384.8	11.54	21.7	2914.9	4.59
15055	Miss	Platte	1	4608.6	7941.5	721.8	1.55	30.3	3855.0	10.61
1	Miss	Mississippi Total	3	36977.4	36977.4	3655.3	53.5	318.2	32950.3	51.78
18000100	Mille	WhiteFish	48001200	2816.2	2816.2	356.8	4.26	9.3	2445.8	3.78
1015700	Mille	BigPine	1020400	1016.8	1016.8	265.2	0.53	32.4	718.6	1.28
1020400	Mille	Round	18002000	636.3	1653.1	290.7	0.00	26.2	319.4	1.93
18003300	Mille	Scott	18001900	226.0	226.0	66.0	0.00	1.9	158.1	0.25
18001900	Mille	Kenney	18002000	223.4	449.4	56.3	0.55	5.8	160.8	0.53
18002100	Mille	Miller	18002000	149.4	149.4	31.6	0.00	2.2	115.7	0.19
18004700	Mille	Turtle	18002000	299.4	299.4	50.7	0.00	2.1	246.6	0.39
18004800	Mille	Partridge	18002000	167.6	167.6	74.4	0.00	4.5	88.8	0.16
18009500	Mille	Chrysler	18002000	149.6	149.6	44.7	0.00	0.0	105.0	0.16
18002000	Mille	Borden	48001200	3955.5	6824.0	533.8	6.81	37.8	3377.0	8.72
18002800	Mille	Smith	18002900	1392.1	1392.1	253.0	2.96	10.5	1125.6	1.79
18001800	Mille	Camp	18002900	2542.2	2542.2	275.9	5.37	15.4	2245.4	3.51
18002900	Mille	Holt	48001200	388.2	4322.4	67.4	0.00	4.2	316.6	5.80
1008500	MilleE	Twenty	48001200	2584.9	2584.9	53.9	2.23	13.6	2515.2	3.86
21004	MilleE	Upper Malone	21003	2016.6	2016.6	0.0	0.63	3.8	2012.1	3.04
21003	MilleE	Thaines	48001200	2614.7	4631.3	14.3	1.66	10.1	2588.7	18.43
1006500	MilleE	Cedar Lake	21005	460.0	460.0	102.2	0.97	5.9	350.9	0.57
21005	MilleE	Cedar Ck	48001200	1540.3	2000.3	0.0	1.28	7.8	1531.2	2.92
21006	MilleE	Seventeen	48001200	1845.7	1845.7	0.0	0.71	4.3	1840.7	2.79
21007	MilleE	Ditch 36	48001200	4398.9	4398.9	0.0	0.80	4.9	4393.2	6.62
21008	MilleE	Malmo	48001200	2711.6	2711.6	18.2	1.19	7.3	2685.0	4.07
21010	MilleE	Peterson	48001200	4399.4	4399.4	0.0	3.16	19.3	4377.0	6.69
21017	MilleE	Groundhouse	48001200	1383.9	1383.9	0.0	0.62	3.8	1379.5	2.09
48001200	Mille	Mille Lacs	21012	69720.6	107639.4	53650.0	62.73	551.9	15456.0	97.78
49000600	Rum	Twelve	21012	352.5	352.5	55.6	0.30	0.9	295.7	0.46
21012	Rum	Ogechie	21014	3234.9	111226.8	189.1	8.52	6.1	3031.1	102.88
21014	Rum	Shakopee	21015	3992.9	115219.7	351.2	6.40	5.5	3629.8	108.42
21015	Rum	Onamia	21018	3175.8	118395.5	444.1	18.42	27.9	2685.4	112.74
21016	Rum	Rum A	21018	1526.6	1526.6	0.0	2.38	7.7	1516.6	2.33
21018	Rum	Rum B	2	5488.9	125411.1	0.0	4.08	43.5	5441.3	123.49
21013	Rum	Rum C	2	8139.6	8139.6	0.0	7.85	13.6	8118.1	12.29
2	Rum	Rum Total	3	133550.6	133550.6	57245.1	144.4	890.1	75271.0	135.78
3	Net	Net Outflow	0	170528.0	170528.0	60900.4	197.9	1208.3	108221.3	187.56

Table 3
Impervious Areas vs. Segment & Alternative

		Total Area	Impervious Area (hectares)						
Segment	**Basin**	**ha**	**Exist**	**NoBld**	**Alt-2**	**Alt-2a**	**Alt-3**	**Alt-4**	**Alt-5**
Bay	Miss	9704	167.90	194.12	186.96	185.35	180.35	202.89	197.51
Nokay	Miss	4726	20.30	21.18	20.80	20.80	20.82	20.79	20.81
Grave	Miss	2901	17.96	22.14	20.37	20.34	20.45	28.44	26.58
Noname A	Miss	2045	2.48	3.06	3.06	3.06	3.06	3.06	3.06
JackPine	Miss	2490	3.20	6.93	5.34	5.32	5.41	15.11	12.90
Skunk	Miss	3966	24.39	24.94	24.70	24.70	24.70	24.70	24.70
Noname B	Miss	3204	30.02	30.11	30.07	30.07	30.07	30.07	30.07
Rock	Miss	3333	21.69	37.54	31.13	31.06	31.43	52.88	47.93
Platte	Miss	4609	30.29	32.64	31.64	31.62	31.68	31.61	31.66
Mississippi Total	Miss	36977	318	373	354	352	348	410	395
WhiteFish	Mille	2816	9.32	26.87	24.00	27.39	25.18	33.28	31.48
BigPine	Mille	1017	32.45	38.21	36.22	36.21	36.31	36.19	36.30
Round	Mille	636	26.24	30.16	28.49	28.45	28.57	28.45	28.52
Scott	Mille	226	1.89	5.00	3.75	3.74	3.79	4.58	4.41
Kenney	Mille	223	5.81	9.62	13.11	13.33	12.05	7.96	8.04
Miller	Mille	149	2.16	4.47	3.49	3.48	3.53	3.47	3.51
Turtle	Mille	299	2.07	4.65	3.55	3.54	3.60	3.54	3.58
Partridge	Mille	168	4.46	7.31	6.10	6.09	6.15	6.07	6.13
Chrysler	Mille	150	0.00	1.11	0.64	0.63	0.66	0.63	0.65
Borden	Mille	3955	37.80	72.09	76.13	76.55	72.85	70.55	68.61
Smith	Mille	1392	10.49	45.94	44.61	44.63	44.44	43.17	43.29
Camp	Mille	2542	15.44	53.07	47.32	47.18	47.55	47.22	47.44
Holt	Mille	388	4.19	4.64	4.77	4.78	4.71	4.44	4.44
Twenty	MilleE	2585	13.64	16.88	16.88	16.88	16.88	16.88	16.88
Upper Malone	MilleE	2017	3.83	4.74	4.74	4.74	4.74	4.74	4.74
Thaines	MilleE	2615	10.13	12.53	12.53	12.53	12.53	12.53	12.53
Cedar Lake	MilleE	460	5.90	7.30	7.30	7.30	7.30	7.30	7.30
Cedar Ck	MilleE	1540	7.79	9.64	9.64	9.64	9.64	9.64	9.64
Seventeen	MilleE	1846	4.32	5.35	5.35	5.35	5.35	5.35	5.35
Ditch 36	MilleE	4399	4.86	6.02	6.02	6.02	6.02	6.02	6.02
Malmo	MilleE	2712	7.29	9.02	9.02	9.02	9.02	9.02	9.02
Peterson	MilleE	4399	19.31	23.90	23.90	23.90	23.90	23.90	23.90
Groundhouse	MilleE	1384	3.78	4.68	4.68	4.68	4.68	4.68	4.68
Mille Lacs	Mille	69721	551.88	587.14	618.98	616.97	599.01	573.82	569.69
Twelve	Rum	353	0.95	1.08	1.02	1.02	1.04	1.02	1.03
Ogechie	Rum	3235	6.08	11.30	9.04	11.94	28.11	14.65	23.03
Shakopee	Rum	3993	5.49	7.33	6.55	6.54	6.60	6.53	6.58
Onamia	Rum	3176	27.90	36.63	37.64	36.60	33.86	31.97	33.80
Rum A	Rum	1527	7.65	11.23	11.22	10.42	7.66	7.66	7.66
Rum B	Rum	5489	43.52	48.90	47.99	47.21	58.72	44.73	50.60
Rum C	Rum	8140	13.59	16.43	15.24	15.23	27.59	15.21	23.09
Rum Total	Rum	133551	890	1123	1140	1142	1152	1085	1102
Net Outflow	Net	170528	1208	1496	1494	1494	1500	1495	1497
Hwy 169 Proj. Watersheds		146572	1128	1396	1394	1394	1400	1395	1397
Other Watersheds (Mille E)		23956	81	100	100	100	100	100	100
Mille Lacs Watershed		107639	785	990	1011	1013	988	963	956

Impervious areas excluding road surfaces

Table 4
Road Surface Areas vs. Segment & Alternative

		Total Area		Road Surface Areas (hectares)					
Segment	**Basin**	**ha**	**Exist**	**NoBld**	**ALT-2**	**ALT-2A**	**ALT-3**	**ALT-4**	**ALT-5**
Bay	Miss	9704	7.30	7.30	8.24	8.24	8.24	17.95	17.95
Nokay	Miss	4726	2.78	2.78	2.78	2.78	2.78	2.78	2.78
Grave	Miss	2901	13.47	13.47	13.47	13.47	13.47	14.11	14.11
Noname A	Miss	2045	0.46	0.46	0.46	0.46	0.46	0.46	0.46
JackPine	Miss	2490	5.95	5.95	5.95	5.95	5.95	12.21	12.21
Skunk	Miss	3966	4.59	4.59	4.59	4.59	4.59	4.59	4.59
Noname B	Miss	3204	5.88	5.88	5.88	5.88	6.52	5.88	6.52
Rock	Miss	3333	11.54	11.54	11.54	11.54	11.54	25.35	25.35
Platte	Miss	4609	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Mississippi Total	Miss	36977	54	54	54	54	55	85	86
WhiteFish	Mille	2816	4.26	4.26	4.26	5.91	7.08	11.68	11.68
BigPine	Mille	1017	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Round	Mille	636	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scott	Mille	226	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kenney	Mille	223	0.55	0.55	0.94	0.94	0.94	0.55	0.55
Miller	Mille	149	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Turtle	Mille	299	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Partridge	Mille	168	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chrysler	Mille	150	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Borden	Mille	3955	6.81	6.81	10.69	10.69	10.69	15.21	15.21
Smith	Mille	1392	2.96	2.96	2.96	6.16	2.96	2.96	2.96
Camp	Mille	2542	5.37	5.37	5.37	5.37	5.37	9.57	9.57
Holt	Mille	388	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Twenty	MilleE	2585	2.23	2.23	2.23	2.23	2.23	2.23	2.23
Upper Malone	MilleE	2017	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Thaines	MilleE	2615	1.66	1.66	1.66	1.66	1.66	1.66	1.66
Cedar Lake	MilleE	460	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Cedar Ck	MilleE	1540	1.28	1.28	1.28	1.28	1.28	1.28	1.28
Seventeen	MilleE	1846	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Ditch 36	MilleE	4399	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Malmo	MilleE	2712	1.19	1.19	1.19	1.19	1.19	1.19	1.19
Peterson	MilleE	4399	3.16	3.16	3.16	3.16	3.16	3.16	3.16
Groundhouse	MilleE	1384	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Mille Lacs	Mille	69721	62.73	62.73	85.53	89.31	74.97	74.36	63.12
Twelve	Rum	353	0.30	0.30	0.30	0.30	0.83	0.30	0.83
Ogechie	Rum	3235	8.52	8.52	9.55	10.33	25.18	20.68	25.66
Shakopee	Rum	3993	6.40	6.40	6.40	6.40	6.40	6.40	6.40
Onamia	Rum	3176	18.42	18.42	18.42	18.28	26.28	18.42	27.72
Rum A	Rum	1527	2.38	2.38	2.38	2.38	2.38	2.38	2.38
Rum B	Rum	5489	4.08	4.08	4.08	4.08	10.21	4.08	10.21
Rum C	Rum	8140	7.85	7.85	7.85	7.85	16.02	7.85	16.02
Rum Total	Rum	133551	144	144	173	182	203	188	206
Net Outflow	Net	170528	198	198	227	236	258	273	292
Hwy 169 Proj. Watersheds		146572	185	185	214	223	245	260	278
Other Watersheds (Mille E)		23956	13	13	13	13	13	13	13
Mille Lacs Watershed		107639	96	96	124	132	116	128	117

Table 5
Road Lengths vs. Segment & Alternative

Segment	Basin	Total Area ha	Road Lengths (lane-kilometers) Exist	NoBld	ALT-2	ALT-2A	ALT-3	ALT-4	ALT-5
Bay	Miss	9704	10.9	10.9	12.8	12.8	12.8	27.9	27.9
Nokay	Miss	4726	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Grave	Miss	2901	27.5	27.5	27.5	27.5	27.5	28.4	28.4
Noname A	Miss	2045	1.1	1.1	1.1	1.1	1.1	1.1	1.1
JackPine	Miss	2490	13.9	13.9	13.9	13.9	13.9	22.5	22.5
Skunk	Miss	3966	10.8	10.8	10.8	10.8	10.8	10.8	10.8
Noname B	Miss	3204	12.3	12.3	12.3	12.3	13.1	12.3	13.1
Rock	Miss	3333	27.0	27.0	27.0	27.0	27.0	48.6	48.6
Platte	Miss	4609	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Mississippi	Miss	36977	111.6	111.6	113.5	113.5	114.4	159.5	160.4
WhiteFish	Mille	2816	10.0	10.0	10.0	12.8	13.7	22.8	22.8
BigPine	Mille	1017	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Round	Mille	636	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scott	Mille	226	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Kenney	Mille	223	0.8	0.8	1.6	1.6	1.6	0.8	0.8
Miller	Mille	149	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Turtle	Mille	299	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Partridge	Mille	168	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chrysler	Mille	150	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Borden	Mille	3955	11.6	11.6	19.2	19.2	19.2	25.5	25.5
Smith	Mille	1392	6.9	6.9	6.9	12.5	6.9	6.9	6.9
Camp	Mille	2542	12.6	12.6	12.6	12.6	12.6	18.0	18.0
Holt	Mille	388	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Twenty	MilleE	2585	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Upper Malo	MilleE	2017	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Thaines	MilleE	2615	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Cedar Lake	MilleE	460	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Cedar Ck	MilleE	1540	2.4	2.4	2.4	2.4	2.4	2.4	2.4
Seventeen	MilleE	1846	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Ditch 36	MilleE	4399	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Malmo	MilleE	2712	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Peterson	MilleE	4399	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Groundhou	MilleE	1384	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Mille Lacs	Mille	69721	99.9	99.9	142.5	148.3	118.9	123.2	100.5
Twelve	Rum	353	0.7	0.7	0.7	0.7	1.4	0.7	1.4
Ogechie	Rum	3235	18.8	18.8	20.9	22.2	42.1	40.1	44.1
Shakopee	Rum	3993	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Onamia	Rum	3176	32.1	32.1	34.9	34.7	47.1	34.9	47.2
Rum A	Rum	1527	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Rum B	Rum	5489	7.1	7.1	7.1	7.1	17.6	7.1	17.6
Rum C	Rum	8140	16.7	16.7	16.7	16.7	28.3	16.7	28.3
Rum Total	Rum	133551	262.1	262.1	317.9	333.2	354.3	341.5	358.0
Net Outflow	Net	170528	373.6	373.6	431.4	446.7	468.6	501.0	518.3
Hwy 169 Proj. Watershe		146572	349	349	406	422	444	476	493
Other Watersheds (Mille		23956	25	25	25	25	25	25	25
Mille Lacs Watershed		107639	168	168	219	233	199	223	200

Table 6
Traffic Density vs. Segment & Alternative

		Total Area	Traffic Density (car-km/day)						
Segment	**Basin**	**ha**	**Exist**	**NoBld**	**ALT-2**	**ALT-2A**	**ALT-3**	**ALT-4**	**ALT-5**
Bay	Miss	9704	17712	40582	54483	54483	55027	60365	76904
Nokay	Miss	4726	4823	13702	16776	16776	16919	10092	18119
Grave	Miss	2901	11256	71045	41084	41084	40417	79973	44100
Noname A	Miss	2045	108	2548	488	488	434	3361	325
JackPine	Miss	2490	1658	22483	6275	6275	5050	45944	45182
Skunk	Miss	3966	2691	20450	3229	3229	3229	7534	3229
Noname B	Miss	3204	4915	27862	11793	11793	22239	7506	15080
Rock	Miss	3333	8503	47296	14507	14507	13053	87403	64868
Platte	Miss	4609	906	6885	1087	1087	1087	2537	1087
Mississippi Total	Miss	36977	52573	252853	149723	149723	157456	304715	268894
WhiteFish	Mille	2816	3771	8769	10536	29289	41498	46632	40688
BigPine	Mille	1017	1817	4582	4464	4464	4424	4385	4543
Round	Mille	636	0	0	0	0	0	0	0
Scott	Mille	226	0	0	0	0	0	0	0
Kenney	Mille	223	2560	4835	5973	5973	6014	2844	2600
Miller	Mille	149	0	0	0	0	0	0	0
Turtle	Mille	299	0	0	0	0	0	0	0
Partridge	Mille	168	0	0	0	0	0	0	0
Chrysler	Mille	150	0	0	0	0	0	0	0
Borden	Mille	3955	24536	51826	57932	57932	57968	68955	57835
Smith	Mille	1392	1040	2774	3121	41140	2081	2774	3468
Camp	Mille	2542	3769	23150	10961	10961	9217	34430	36289
Holt	Mille	388	0	0	0	0	0	0	0
Twenty	MilleE	2585	1884	2333	2333	2333	2333	2333	2333
Upper Malone	MilleE	2017	529	654	654	654	654	654	654
Thaines	MilleE	2615	1399	1732	1732	1732	1732	1732	1732
Cedar Lake	MilleE	460	815	1009	1009	1009	1009	1009	1009
Cedar Ck	MilleE	1540	1076	1332	1332	1332	1332	1332	1332
Seventeen	MilleE	1846	597	739	739	739	739	739	739
Ditch 36	MilleE	4399	672	831	831	831	831	831	831
Malmo	MilleE	2712	1007	1247	1247	1247	1247	1247	1247
Peterson	MilleE	4399	2668	3303	3303	3303	3303	3303	3303
Groundhouse	MilleE	1384	522	647	647	647	647	647	647
Mille Lacs	Mille	69721	323361	738142	852101	805369	595663	696187	538325
Twelve	Rum	353	160	285	285	285	6205	499	3851
Ogechie	Rum	3235	14512	31145	34523	40003	156457	115875	116581
Shakopee	Rum	3993	2623	13488	749	749	4496	749	32971
Onamia	Rum	3176	51184	137782	111372	109863	140763	121452	137551
Rum A	Rum	1527	9250	24256	24256	24256	9559	24256	12334
Rum B	Rum	5489	15868	41610	41610	41610	63453	41610	51030
Rum C	Rum	8140	10692	29000	9083	9083	113242	18914	72096
Rum Total	Rum	133551	476312	1125474	1180795	1194808	1224866	1193391	1123989
Net Outflow	Net	170528	528885	1378327	1330518	1344530	1382322	1498106	1392883
Hwy 169 Proj. Watersheds		146572	517717	1364500	1316690	1330703	1368495	1484278	1379056
Other Watersheds (Mille E)		23956	11168	13827	13827	13827	13827	13827	13827
Mille Lacs Watershed		107639	372022	847906	958916	968956	730691	870034	697575

Table 7
PondNet Input Values

Variable	Units	Value	Notes
Baseflow P Conc	ppb	40	25th percentile of tributary concentrations measured in 2000
Road Runoff P Conc	ppb	650	pondnet default; typical of urban runoff in minnesota (Walker, 1987;1989)
Urban Runoff P Conc	ppb	650	pondnet default; typical of urban runoff in minnesota (Walker,1985b;1987;1989)
Perv Runoff P Conc	ppb	120	calibrated to year 2000 tributary data (Figure 11)
Atmos P Deposition	kg/km2-yr	20	from mpca (2001) bathtub input file
Rainfall (2000)	m/yr	0.58	ncdc, avg of minn. regions 5 & 6 , year 2000, Figure 7
Rainfall (Average Year)	m/yr	0.70	" , 1929-2000 average
Rainfall (Wet Year)	m/yr	0.87	" , 90th percentile, 1929-2000
Pervious Area ET (2000)	m/yr	0.50	rum river et (precip - runoff), USGS 05286000 year 2000, Figure 7
Pervious Area ET (Average)	m/yr	0.55	" , 1929-2000 average
Pervious Area ET (Wet Yr)	m/yr	0.61	" , 90th percentile, 1929-2000
Regional Lake Evap	m/yr	0.69	regional value = 27 inches/yr (Linsley et al, 1975)
Impervious Runoff Coef	-	0.7	schueler (1987); p8 calibration to wisconsin watersheds (Walker, 1997)
Pervious Runoff Coef	-	0.05	schueler (1987)
Monitored Period	-	0.61	year 2000 trib monitoring period (221 days) as fraction of year
Increase in Lake Storage	m	-0.19	measured change in lake elev, april-nov 2000 (Figure 8)
Thaines Extra Baseflow	m/yr	0.44	extra baseflow added to Thaines Creek, calibrated to Year 2000 data
P Settling Rate - Mille Lacs	m/yr	1.7	calibrated to june-aug 2000 lake mean total p conc (17.3 ppb)
P Settling Rate - Other Lakes	m/yr	3.0	calibrated to year 2000 tributary data (Figure 11)
Road Salt Application Rate	mton/lane-km	3.9	state average, from MDOT (200,000 tons applied to 28,996 lane-mi)
TSS Settling Rate	m/yr	80	10% particle settling rate in urban runoff, nurp / p8 model (0.03 ft/hr)
TSS Settling Rate - Mille Lacs	m/yr	40	50 % of above
Traffic Contaminant Settling Rate	m/yr	40	assumed
" " - Mille Lacs	m/yr	20	assumed
Point Sources			
Vineland WWTP	hm3/yr	0.17	to mille lacs, from mpca (2001) bathtub input file; diverted in future
Vineland P Load	kg/yr	51	to mille lacs, from mpca (2001) bathtub input file; diverted in future
Septic Tank P Load	kg/yr	1500	to mille lacs, from mpca (2001) bathtub input file
Future Wetland Discharge	hm3/yr	0.86	to ogechie lake, mpca, future scenarios (mpca, pers com, 2001)
Future Wetland P Load	kg/yr	43.2	assuming discharge at background conc ~ 50 ppb (Kadlec, pers com, 2001)

Table 8
Water & Phosphorus Mass Balance Summary - Year 2000 Calibration

Variable: **Total P** **Alt: Exist** **No Build - Existing Land Use**

	Area ha	Flow hm3/yr	Load kg/yr	Conc ppb	Runoff m/yr	Export kg/km2-yr
Sources						
Imperv Runoff	1208	4.9	1276	260	0.41	105.6
Perv Runoff	108221	31.4	3766	120	0.03	3.5
Road Runoff	198	0.8	209	260	0.41	105.6
Base Flow	109628	67.0	2464	37	0.06	2.2
Total Flow	109628	104.1	7715	74	0.09	7.0
Road-Lane Related			0			
Net Atmospheric	60900	-67.0	12180			20.0
Total Nonpoint	170528	37.1	19895	537	0.02	11.7
Point Sources		0.2	51	300		
Septic Tanks			1500			
Total Sources	170528	37.2	21446	576	0.02	12.6
Total Retention			19574			
Net Outflow	170528	37.2	1872	50	0.02	1.1
Mille Lacs Lake						
WhiteFish	2816	1.6	27.4	17	0.06	1.0
Borden	6824	3.2	55.7	17	0.05	0.8
Holt	4322	2.5	42.6	17	0.06	1.0
Twenty	2585	2.0	92.5	46	0.08	3.6
Thaines	4631	15.2	711.7	47	0.33	15.4
Cedar Ck	2000	1.5	97.0	66	0.07	4.9
Seventeen	1846	1.5	107.0	72	0.08	5.8
Ditch 36	4399	3.5	248.5	70	0.08	5.6
Malmo	2712	2.2	128.5	59	0.08	4.7
Peterson	4399	3.6	265.5	74	0.08	6.0
Groundhouse	1384	1.1	80.8	72	0.08	5.8
Total Tributaries	37919	37.9	1857	49	0.10	4.9
Direct Drainage	16071	15.0	1508	100	0.09	9.4
Total Watershed	53989	52.9	3365	64	0.10	6.2
Point Sources		0.2	51			
Septic Tanks			1500			
Rainfall	53650	311.2	10730	34	0.58	20.0
Total Inflow	53650	364.2	15646	43	0.68	29.2
Evaporation	53650	370.2			0.69	
Retention		-6.0	15646			
Outflow	107639	0.0	0	17	0.00	0.0
Exported from Region						
Rum Riv Basin	133551	19.3	1053	55	0.01	0.8
Mississippi Riv Basin	36977	23.9	820	34	0.06	2.2
Total Export	170528	43.2	1872	43	0.03	1.1
Mass Balance Check	0	0.0	0.0			

Table 9
Summary of Impacts on Outflows to Rum River, & Mississippi River

Case	1	2	3	4	5	6	7	8	9	10	11
Variable	TP	TP	TP	TP	TP	TSS	TSS	Salt	Salt	Traffic	Traffic
Precipitation	Average	Wet (90%)	Average	Average	Average	Average	Wet (90%)	Average	Wet (90%)	Average	Wet (90%)
Future Road BMP's	No	No	No	Yes	Yes	No	No	No	No	No	No
Future Development BMP's	No	No	No	No	Yes	No	No	No	No	No	No
Concentration Units	ppb	ppb	ppb	ppb	ppb	ppm	ppm	ppm	ppm	relative	relative
Load Units	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	mtons/yr	mtons/yr	mtons/yr	mtons/yr	relative	relative
Settling Rate - Mille Lacs	1.7	1.7	1.7	1.7	1.7	40.0	40.0	0.0	0.0	20.0	20.0
Settling Rate - Other	3.0	3.0	0.0	3.0	3.0	80.0	80.0	0.0	0.0	40.0	40.0
Table - Mass Balance Summary	A-2	A-3	A-4	A-5	A-6	A-7	A-8	A-9	A-10	A-11	A-12
Table - Mass Balance by Segment	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9	B-10	B-11	B-12
Table - Impacts	C-2	C-3	C-4	C-5	C-6	C-7	C-8	C-9	C-10	C-11	C-12
Figure - Impacts	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10	D-11	D-12
Rum River Existing Conc	27.0	24.0	32.5	27.0	27.0	4.4	2.6	7.5	3.2	42.6	23.6
NoBld	1.1%	0.9%	1.2%	1.1%	0.4%	0.2%	0.6%	-0.7%	-0.3%	166%	165%
Alt-2	1.1%	1.1%	1.2%	1.0%	0.4%	0.0%	0.5%	20.4%	20.9%	111%	113%
Alt-2A	1.1%	1.1%	1.3%	1.0%	0.4%	-0.1%	0.4%	26.1%	26.7%	110%	114%
Alt-3	2.9%	2.2%	2.9%	2.2%	1.0%	2.0%	2.6%	34.0%	34.6%	342%	335%
Alt-4	1.0%	0.9%	1.3%	0.8%	0.4%	-0.4%	0.1%	29.4%	29.9%	148%	167%
Alt-5	2.4%	1.8%	2.5%	1.7%	0.8%	1.4%	2.0%	35.6%	36.1%	255%	263%
Rum River Existing Load	3664.4	7608.8	4408.6	3664.4	3664.4	597.7	812.3	1020.6	1020.6	5780.9	7493.2
NoBld	2.3%	1.5%	2.4%	2.3%	1.6%	0.9%	1.0%	0.0%	0.0%	167%	166%
Alt-2	2.4%	1.7%	2.5%	2.3%	1.7%	0.8%	0.9%	21.3%	21.3%	112%	114%
Alt-2A	2.4%	1.7%	2.6%	2.3%	1.7%	0.7%	0.8%	27.1%	27.1%	112%	114%
Alt-3	4.4%	2.9%	4.4%	3.7%	2.4%	2.9%	3.1%	35.2%	35.2%	346%	337%
Alt-4	2.2%	1.5%	2.5%	2.0%	1.6%	0.3%	0.5%	30.3%	30.3%	150%	167%
Alt-5	3.7%	2.4%	3.8%	3.0%	2.1%	2.2%	2.4%	36.6%	36.6%	258%	264%
Mississippi River Existing Conc	31.0	30.3	72.0	31.0	31.0	2.7	2.4	8.4	4.6	9.0	7.4
NoBld	0.7%	0.8%	1.3%	0.7%	0.1%	-0.1%	0.1%	-0.4%	-0.2%	544%	526%
Alt-2	0.5%	0.5%	0.9%	0.5%	0.1%	-0.1%	0.1%	1.4%	1.6%	188%	191%
Alt-2A	0.5%	0.5%	0.9%	0.4%	0.1%	-0.1%	0.1%	1.5%	1.6%	188%	191%
Alt-3	0.5%	0.5%	0.8%	0.4%	0.1%	0.0%	0.1%	2.3%	2.4%	270%	263%
Alt-4	2.0%	2.1%	3.0%	1.6%	0.4%	0.0%	0.5%	41.7%	42.2%	455%	453%
Alt-5	1.8%	1.9%	2.7%	1.4%	0.4%	0.0%	0.5%	42.6%	43.0%	377%	386%
Mississippi River Existing Load	1603.9	2869.6	3730.4	1603.9	1603.9	142.3	228.2	434.5	434.5	464.5	699.8
NoBld	1.2%	1.1%	1.7%	1.2%	0.5%	0.3%	0.4%	0.0%	0.0%	546%	527%
Alt-2	0.7%	0.7%	1.2%	0.7%	0.4%	0.2%	0.2%	1.7%	1.7%	189%	191%
Alt-2A	0.7%	0.7%	1.1%	0.7%	0.3%	0.2%	0.2%	1.7%	1.7%	189%	191%
Alt-3	0.7%	0.6%	1.0%	0.7%	0.3%	0.2%	0.3%	2.5%	2.5%	271%	264%
Alt-4	2.9%	2.7%	4.0%	2.5%	1.3%	0.9%	1.1%	43.0%	43.0%	460%	456%
Alt-5	2.6%	2.4%	3.5%	2.2%	1.2%	0.8%	1.0%	43.7%	43.7%	381%	388%

For each variable, table shows value for existing scenario and percent increases for each highway alternative

Table 10
Summary of Impacts on Mille Lacs Lake

Case	1	2	3	4	5	6	7	8	9	10	11
Variable	TP	TP	TP	TP	TP	TSS	TSS	Salt	Salt	Traffic	Traffic
Precipitation	Average	Wet (90%)	Average	Average	Average	Average	Wet (90%)	Average	Wet (90%)	Average	Wet (90%)
Future Road BMP's	No	No	No	Yes	Yes	No	No	No	No	No	No
Future Development BMP's	No	No	No	No	Yes	No	No	No	No	No	No
Concentration Units	ppb	ppb	ppb	ppb	ppb	ppm	ppm	ppm	ppm	relative	relative
Load Units	kg/yr	kg/yr	kg/yr	kg/yr	kg/yr	mtons/yr	mtons/yr	mtons/yr	mtons/yr	relative	relative
Settling Rate - Mille Lacs	1.7	1.7	1.7	1.7	1.7	40.0	40.0	0.0	0.0	20.0	20.0
Settling Rate - Other	3.0	3.0	0.0	3.0	3.0	80.0	80.0	0.0	0.0	40.0	40.0
Mille Lacs Existing Concentration	17.3	17.3	18.7	17.3	17.3	0.1	0.1	6.7	2.6	3.1	3.0
NoBld	0.3%	0.5%	1.0%	0.3%	-0.1%	1.2%	1.3%	-0.8%	-0.3%	126%	126%
Alt-2	0.6%	0.9%	1.3%	0.5%	0.0%	2.6%	2.6%	29.2%	29.9%	160%	160%
Alt-2A	0.7%	0.9%	1.3%	0.5%	0.0%	2.7%	2.7%	37.5%	38.3%	146%	146%
Alt-3	0.4%	0.7%	1.1%	0.4%	0.0%	1.9%	1.9%	17.5%	18.1%	83%	84%
Alt-4	0.3%	0.5%	1.0%	0.2%	-0.1%	1.2%	1.2%	31.9%	32.5%	114%	114%
Alt-5	0.2%	0.4%	0.9%	0.2%	-0.1%	0.8%	0.8%	18.6%	19.1%	66%	66%
Mille Lacs Existing Conc - NonPoint Only	15.7	15.9	17.1	15.7	15.7	0.1	0.1	6.7	2.6	3.1	3.0
NoBld	0.6%	0.8%	1.4%	0.6%	0.2%	1.2%	1.3%	-0.8%	-0.3%	126%	126%
Alt-2	1.0%	1.2%	1.7%	0.9%	0.3%	2.6%	2.6%	29.2%	29.9%	160%	160%
Alt-2A	1.1%	1.3%	1.8%	0.9%	0.4%	2.7%	2.7%	37.5%	38.3%	146%	146%
Alt-3	0.8%	1.0%	1.5%	0.7%	0.3%	1.9%	1.9%	17.5%	18.1%	83%	84%
Alt-4	0.6%	0.9%	1.4%	0.6%	0.2%	1.2%	1.2%	31.9%	32.5%	114%	114%
Alt-5	0.5%	0.7%	1.3%	0.5%	0.2%	0.8%	0.8%	18.6%	19.1%	66%	66%
Mille Lacs Existing Outflow Volume (hm3/yı	97.8	250.3	97.8	97.8	97.8	97.6	250.1	97.6	250.1	97.6	250.1
NoBld	98.4	251.0	98.4	98.4	98.4	98.4	251.0	98.4	251.0	98.4	251.0
Alt-2	98.6	251.2	98.6	98.6	98.6	98.6	251.2	98.6	251.2	98.6	251.2
Alt-2A	98.6	251.2	98.6	98.6	98.6	98.6	251.2	98.6	251.2	98.6	251.2
Alt-3	98.5	251.1	98.5	98.5	98.5	98.5	251.1	98.5	251.1	98.5	251.1
Alt-4	98.4	251.0	98.4	98.4	98.4	98.4	251.0	98.4	251.0	98.4	251.0
Alt-5	98.3	250.9	98.3	98.3	98.3	98.3	250.9	98.3	250.9	98.3	250.9
Mille Lacs Existing External Load	6585.8	9201.0	8004.6	6585.8	6585.8	1411.2	1791.1	652.7	652.7	33211	33349
NoBld	0.9%	1.2%	2.5%	0.9%	-0.1%	1.2%	1.3%	0.0%	0.0%	126%	126%
Alt-2	1.9%	2.1%	3.2%	1.6%	0.3%	2.6%	2.6%	30.4%	30.4%	160%	160%
Alt-2A	2.0%	2.2%	3.3%	1.7%	0.3%	2.7%	2.7%	38.9%	38.9%	146%	146%
Alt-3	1.4%	1.6%	2.7%	1.2%	0.1%	1.9%	1.9%	18.6%	18.6%	83%	84%
Alt-4	1.0%	1.3%	2.5%	0.8%	0.0%	1.2%	1.2%	33.0%	33.0%	114%	114%
Alt-5	0.7%	1.0%	2.3%	0.6%	-0.2%	0.8%	0.8%	19.5%	19.5%	66%	66%
Mille Lacs Existing NonPoint Load	5034.8	7650.0	6453.6	5034.8	5034.8	1411.2	1791.1	652.7	652.7	33211	33349
NoBld	2.2%	2.1%	3.8%	2.2%	0.9%	1.2%	1.3%	0.0%	0.0%	126%	126%
Alt-2	3.5%	3.2%	4.7%	3.1%	1.4%	2.6%	2.6%	30.4%	30.4%	160%	160%
Alt-2A	3.6%	3.3%	4.9%	3.2%	1.4%	2.7%	2.7%	38.9%	38.9%	146%	146%
Alt-3	2.8%	2.6%	4.2%	2.6%	1.1%	1.9%	1.9%	18.6%	18.6%	83%	84%
Alt-4	2.3%	2.2%	3.9%	2.0%	1.0%	1.2%	1.2%	33.0%	33.0%	114%	114%
Alt-5	1.9%	1.9%	3.6%	1.8%	0.8%	0.8%	0.8%	19.5%	19.5%	66%	66%

For each variable, table shows value for existing scenario and percent increases for each alternative
External Loads exclude atmospheric deposition.
NonPoint loads exclude atmospheric deposition, septic tanks, point sources

Appendix A

Segment Mass Balances

Page/Case	Variable	Hydrology	Assumptions
1	Total P	2000 Calibration	
2	Total P	Average Year	
3	Total P	Wet Year	
4	Total P	Average Year	No P Retention in Upstream Lakes
5	Total P	Average Year	BMP's on New Roads
6	Total P	Average Year	BMP's on New Roads & New Urban Areas
7	TSS	Average Year	
8	TSS	Wet Year	
9	Road Salt	Average Year	
10	Road Salt	Wet Year	
11	Traffic Contam.	Average Year	
12	Traffic Contam.	Wet Year	

Note: Page Numbers Correspond to Cases Identified in Tables 9 & 10

Road BMPs: No | Urban BMP's: No | Precip: 0.58 m/yr

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	Basin	Code	Segment	Cumulative	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	6.67	19.07	4.31	556.5	984.1	62.0	83.5	51.6	14.4
Nokay	Miss	10107	4726.3	4726.3	164.6	3.73	4.68	3.55	251.9	284.8	119.1	67.5	60.8	33.6
Grave	Miss	10109	2901.2	2901.2	93.3	2.36	2.90	2.25	172.5	191.2	85.3	73.2	66.0	37.8
Noname A	Miss	10110	2044.8	2044.8	0.0	1.65	1.65	1.65	105.4	105.4	105.4	64.0	64.0	64.0
JackPine	Miss	10120	2489.8	2489.8	43.5	1.99	2.24	1.94	131.8	140.5	84.0	66.3	62.7	43.3
Skunk	Miss	15024	3965.8	3965.8	90.3	3.20	3.73	3.10	223.5	241.6	129.0	69.8	64.8	41.6
Noname B	Miss	15025	3203.6	3203.6	18.8	2.67	2.78	2.65	195.9	199.7	164.6	73.3	71.8	62.1
Rock	Miss	15056	3333.0	3333.0	384.8	2.47	4.71	2.05	181.4	258.3	39.0	73.3	54.9	19.0
Platte	Miss	15055	4608.6	7941.5	721.8	3.22	9.46	4.48	227.0	410.3	70.3	70.5	43.4	15.7
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	23.94	23.94	0.0	819.7	819.7		34.2	34.2
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	2.02	4.08	1.62	137.0	208.3	27.4	68.0	51.0	16.9
BigPine	Mille	1015700	1016.8	1016.8	265.2	0.72	2.25	0.43	71.0	124.1	6.3	99.1	55.0	14.8
Round	Mille	1020400	636.3	1653.1	290.7	0.37	2.48	0.47	43.9	108.3	5.6	119.1	43.7	11.8
Scott	Mille	18003300	226.0	226.0	66.0	0.13	0.52	0.06	9.9	23.1	0.7	73.8	44.7	11.3
Kenney	Mille	18001900	223.4	449.4	56.3	0.16	0.54	0.16	14.8	26.8	2.3	94.9	49.2	14.5
Miller	Mille	18002100	149.4	149.4	31.6	0.10	0.28	0.07	8.1	14.4	1.0	79.5	50.6	14.2
Turtle	Mille	18004700	299.4	299.4	50.7	0.21	0.50	0.15	14.6	24.7	2.2	70.6	49.4	14.8
Partridge	Mille	18004800	167.6	167.6	74.4	0.09	0.52	0.01	9.2	24.1	0.1	101.8	46.1	10.7
Chrysler	Mille	18009500	149.6	149.6	44.7	0.08	0.34	0.03	5.3	14.2	0.4	62.6	41.4	10.3
Borden	Mille	18002000	3955.5	6824.0	533.8	2.89	6.88	3.20	216.6	334.8	55.7	74.9	48.7	17.4
Smith	Mille	18002800	1392.1	1392.1	253.0	0.96	2.43	0.68	70.7	121.3	10.0	73.8	50.0	14.7
Camp	Mille	18001800	2542.2	2542.2	275.9	1.89	3.49	1.58	146.1	201.3	32.3	77.5	57.7	20.4
Holt	Mille	18002900	388.2	4322.4	67.4	0.27	2.92	2.46	21.9	77.7	42.6	80.9	26.6	17.3
Twenty	MilleE	1008500	2584.9	2584.9	53.9	2.08	2.39	2.02	155.7	166.5	92.5	74.9	69.6	45.8
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	1.63	1.63	1.63	115.8	115.8	115.8	71.1	71.1	71.1
Thaines	MilleE	21003	2614.7	4631.3	14.3	13.56	15.28	15.18	613.1	731.8	711.7	45.2	47.9	46.9
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.31	0.90	0.20	26.7	47.1	2.9	86.0	52.2	14.4
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	1.26	1.46	1.46	94.2	97.0	97.0	74.5	66.4	66.4
Seventeen	MilleE	21006	1845.7	1845.7	0.0	1.49	1.49	1.49	107.0	107.0	107.0	71.6	71.6	71.6
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	3.54	3.54	3.54	248.5	248.5	248.5	70.2	70.2	70.2
Malmo	MilleE	21008	2711.6	2711.6	18.2	2.18	2.29	2.16	157.2	160.9	128.5	72.0	70.3	59.4
Peterson	MilleE	21010	4399.4	4399.4	0.0	3.60	3.60	3.60	265.5	265.5	265.5	73.8	73.8	73.8
Groundhous	MilleE	21017	1383.9	1383.9	0.0	1.12	1.12	1.12	80.8	80.8	80.8	72.0	72.0	72.0
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	15.18	364.20	0.00	3058.9	15646.3	0.0	201.5	43.0	
Twelve	Rum	49000600	352.5	352.5	55.6	0.24	0.56	0.18	17.7	28.8	2.8	73.0	51.0	15.6
Ogechie	Rum	21012	3234.9	111226.8	189.1	2.49	3.77	2.46	182.9	223.5	67.6	73.5	59.4	27.5
Shakopee	Rum	21014	3992.9	115219.7	351.2	2.95	7.45	5.03	213.0	350.9	113.4	72.1	47.1	22.5
Onamia	Rum	21015	3175.8	118395.5	444.1	2.35	9.95	6.89	197.6	399.8	136.2	84.2	40.2	19.8
Rum A	Rum	21016	1526.6	1526.6	0.0	1.26	1.26	1.26	94.4	94.4	94.4	75.1	75.1	75.1
Rum B	Rum	21018	5488.9	125411.1	0.0	4.56	12.70	12.70	351.1	581.7	581.7	77.0	45.8	45.8
Rum C	Rum	21013	8139.6	8139.6	0.0	6.59	6.59	6.59	471.0	471.0	471.0	71.5	71.5	71.5
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	19.29	19.29	0.0	1052.7	1052.7		54.6	54.6
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	43.23	43.23	0.0	1872.4	1872.4		43.3	43.3

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	**Basin**	**Code**	**Segment**	**Cumulative**	**Area (ha)**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**
Bay	Miss	10035	9704.3	9704.3	2138.2	12.02	26.99	12.24	791.0	1218.6	195.2	65.8	45.1	16.0
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.08	6.95	376.9	409.8	239.6	54.4	50.7	34.5
Grave	Miss	10109	2901.2	2901.2	93.3	4.33	4.99	4.34	252.9	271.5	165.1	58.4	54.5	38.0
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.70	4.01	3.71	198.2	206.9	153.1	53.5	51.6	41.3
Skunk	Miss	15024	3965.8	3965.8	90.3	5.92	6.56	5.93	331.6	349.6	240.0	56.0	53.3	40.5
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.1	290.9	260.9	58.4	57.6	53.1
Rock	Miss	15056	3333.0	3333.0	384.8	4.55	7.24	4.59	265.8	342.7	97.5	58.4	47.3	21.2
Platte	Miss	15055	4608.6	7941.5	721.8	5.95	15.59	10.61	335.9	577.7	190.0	56.4	37.0	17.9
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	51.78	51.78	0.0	1603.9	1603.9		31.0	31.0
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.74	6.24	3.78	204.6	275.9	72.0	54.7	44.2	19.1
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.25	3.11	1.28	97.4	150.5	20.9	77.7	48.4	16.3
Round	Mille	1020400	636.3	1653.1	290.7	0.62	3.94	1.93	58.2	137.2	24.9	94.0	34.9	12.9
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.71	0.25	14.5	27.7	3.2	58.8	39.1	12.4
Kenney	Mille	18001900	223.4	449.4	56.3	0.28	0.92	0.53	20.5	34.9	8.4	74.4	37.8	15.7
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	11.6	17.9	3.0	62.8	44.2	15.8
Turtle	Mille	18004700	299.4	299.4	50.7	0.38	0.74	0.39	21.5	31.7	6.4	56.5	43.0	16.6
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.16	12.5	27.4	1.9	79.8	40.4	11.4
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	8.0	17.0	1.8	51.0	36.1	11.3
Borden	Mille	18002000	3955.5	6824.0	533.8	5.30	12.41	8.72	315.8	468.9	165.3	59.5	37.8	19.0
Smith	Mille	18002800	1392.1	1392.1	253.0	1.76	3.53	1.79	103.4	154.0	29.3	58.7	43.6	16.4
Camp	Mille	18001800	2542.2	2542.2	275.9	3.48	5.41	3.51	224.5	279.7	83.2	64.5	51.7	23.7
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.26	5.80	33.3	159.3	118.1	66.9	25.4	20.4
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.86	4.23	3.86	241.8	252.6	178.1	62.7	59.7	46.1
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	3.04	3.04	3.04	182.8	182.8	182.8	60.1	60.1	60.1
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.39	18.53	18.43	700.7	886.4	866.2	45.5	47.8	47.0
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.56	1.28	0.57	39.7	60.2	9.5	70.6	47.1	16.5
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.92	2.92	146.5	155.9	155.9	62.4	53.4	53.4
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	168.5	168.5	168.5	60.4	60.4	60.4
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	393.9	393.9	393.9	59.5	59.5	59.5
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.07	4.20	4.07	247.2	250.9	221.3	60.7	59.7	54.3
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.69	6.69	6.69	414.2	414.2	414.2	62.0	62.0	62.0
Groundhou	MilleE	21017	1383.9	1383.9	0.0	2.09	2.09	2.09	127.1	127.1	127.1	60.7	60.7	60.7
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.64	467.96	97.78	3705.2	17315.8	1689.2	139.1	37.0	17.3
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	27.6	38.8	8.3	61.4	46.2	18.3
Ogechie	Rum	21012	3234.9	111226.8	189.1	4.62	104.18	102.88	285.6	2020.9	1915.3	61.8	19.4	18.6
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	110.84	108.42	334.8	2320.3	2114.8	60.8	20.9	19.5
Onamia	Rum	21015	3175.8	118395.5	444.1	4.28	115.81	112.74	296.2	2499.8	2235.6	69.3	21.6	19.8
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	146.4	146.4	146.4	62.9	62.9	62.9
Rum B	Rum	21018	5488.9	125411.1	0.0	8.42	123.49	123.49	540.3	2922.3	2922.3	64.2	23.7	23.7
Rum C	Rum	21013	8139.6	8139.6	0.0	12.29	12.29	12.29	742.1	742.1	742.1	60.4	60.4	60.4
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	135.78	135.78	0.0	3664.4	3664.4		27.0	27.0
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	187.56	187.56	0.0	5268.4	5268.4		28.1	28.1

Road BMPs: No | Urban BMP's: No | Precip: 0.87 m/yr

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	Basin	Code	Segment	Cumulative	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	20.42	39.02	24.27	1147.4	1575.0	432.3	56.2	40.4	17.8
Nokay	Miss	10107	4726.3	4726.3	164.6	11.96	13.39	12.26	568.8	601.7	428.9	47.6	44.9	35.0
Grave	Miss	10109	2901.2	2901.2	93.3	7.43	8.25	7.60	375.8	394.4	288.3	50.5	47.8	37.9
Noname A	Miss	10110	2044.8	2044.8	0.0	5.33	5.33	5.33	243.9	243.9	243.9	45.8	45.8	45.8
JackPine	Miss	10120	2489.8	2489.8	43.5	6.40	6.78	6.48	300.2	308.9	257.1	46.9	45.6	39.7
Skunk	Miss	15024	3965.8	3965.8	90.3	10.20	10.99	10.36	497.2	515.3	408.5	48.7	46.9	39.4
Noname B	Miss	15025	3203.6	3203.6	18.8	8.43	8.60	8.47	426.6	430.3	403.4	50.6	50.1	47.6
Rock	Miss	15056	3333.0	3333.0	384.8	7.81	11.15	8.50	394.9	471.8	200.1	50.6	42.3	23.5
Platte	Miss	15055	4608.6	7941.5	721.8	10.24	25.02	20.04	502.8	847.2	407.2	49.1	33.9	20.3
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	94.80	94.80	0.0	2869.6	2869.6		30.3	30.3
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	6.45	9.56	7.09	308.3	379.7	151.4	47.8	39.7	21.3
BigPine	Mille	1015700	1016.8	1016.8	265.2	2.09	4.40	2.57	137.2	190.2	46.5	65.5	43.2	18.1
Round	Mille	1020400	636.3	1653.1	290.7	1.01	6.11	4.11	79.6	184.2	59.0	78.7	30.1	14.4
Scott	Mille	18003300	226.0	226.0	66.0	0.42	1.00	0.54	21.6	34.8	7.5	50.8	34.8	13.8
Kenney	Mille	18001900	223.4	449.4	56.3	0.46	1.49	1.11	29.0	47.8	18.9	62.9	32.0	17.1
Miller	Mille	18002100	149.4	149.4	31.6	0.32	0.59	0.37	17.0	23.3	6.6	53.9	39.5	17.7
Turtle	Mille	18004700	299.4	299.4	50.7	0.66	1.10	0.75	32.2	42.4	13.9	49.2	38.6	18.7
Partridge	Mille	18004800	167.6	167.6	74.4	0.26	0.91	0.40	17.6	32.4	4.9	67.2	35.7	12.3
Chrysler	Mille	18009500	149.6	149.6	44.7	0.27	0.66	0.35	12.3	21.2	4.4	45.1	32.1	12.5
Borden	Mille	18002000	3955.5	6824.0	533.8	9.09	20.81	17.13	467.3	681.8	352.3	51.4	32.8	20.6
Smith	Mille	18002800	1392.1	1392.1	253.0	3.02	5.22	3.47	153.5	204.1	64.1	50.8	39.1	18.4
Camp	Mille	18001800	2542.2	2542.2	275.9	5.98	8.38	6.48	345.3	400.4	175.8	57.7	47.8	27.1
Holt	Mille	18002900	388.2	4322.4	67.4	0.85	11.39	10.93	50.7	304.1	256.6	59.5	26.7	23.5
Twenty	MilleE	1008500	2584.9	2584.9	53.9	6.65	7.12	6.75	374.7	385.5	311.0	56.4	54.2	46.1
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	5.26	5.26	5.26	286.5	286.5	286.5	54.4	54.4	54.4
Thaines	MilleE	21003	2614.7	4631.3	14.3	18.25	23.64	23.54	836.0	1125.3	1105.2	45.8	47.6	46.9
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.96	1.85	1.14	59.8	80.2	21.8	62.3	43.4	19.1
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	4.04	5.19	5.19	227.2	249.0	249.0	56.2	48.0	48.0
Seventeen	MilleE	21006	1845.7	1845.7	0.0	4.82	4.82	4.82	263.6	263.6	263.6	54.7	54.7	54.7
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	11.46	11.46	11.46	618.9	618.9	618.9	54.0	54.0	54.0
Malmo	MilleE	21008	2711.6	2711.6	18.2	7.04	7.20	7.07	386.4	390.0	362.1	54.9	54.2	51.2
Peterson	MilleE	21010	4399.4	4399.4	0.0	11.53	11.53	11.53	643.8	643.8	643.8	55.8	55.8	55.8
Groundhou	MilleE	21017	1383.9	1383.9	0.0	3.62	3.62	3.62	198.6	198.6	198.6	54.9	54.9	54.9
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	44.58	620.46	250.27	4688.6	19931.0	4319.5	105.2	32.1	17.3
Twelve	Rum	49000600	352.5	352.5	55.6	0.78	1.26	0.88	43.1	54.2	18.7	55.4	43.0	21.3
Ogechie	Rum	21012	3234.9	111226.8	189.1	7.98	260.78	259.47	444.3	4820.3	4717.2	55.7	18.5	18.2
Shakopee	Rum	21014	3992.9	115219.7	351.2	9.52	272.05	269.62	523.0	5310.4	5110.7	54.9	19.5	19.0
Onamia	Rum	21015	3175.8	118395.5	444.1	7.30	280.79	277.72	447.5	5647.0	5388.5	61.3	20.1	19.4
Rum A	Rum	21016	1526.6	1526.6	0.0	4.01	4.01	4.01	226.7	226.7	226.7	56.5	56.5	56.5
Rum B	Rum	21018	5488.9	125411.1	0.0	14.47	296.21	296.21	832.1	6447.3	6447.3	57.5	21.8	21.8
Rum C	Rum	21013	8139.6	8139.6	0.0	21.25	21.25	21.25	1161.4	1161.4	1161.4	54.6	54.6	54.6
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	317.47	317.47	0.0	7608.8	7608.8		24.0	24.0
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	412.27	412.27	0.0	10478.4	10478.4		25.4	25.4

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	Basin	Code	Segment	Cumulative	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	12.02	26.99	12.24	791.0	1218.6	1218.6	65.8	45.1	99.6
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.08	6.95	376.9	409.8	409.8	54.4	50.7	59.0
Grave	Miss	10109	2901.2	2901.2	93.3	4.33	4.99	4.34	252.9	271.5	271.5	58.4	54.5	62.5
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.70	4.01	3.71	198.2	206.9	206.9	53.5	51.6	55.8
Skunk	Miss	15024	3965.8	3965.8	90.3	5.92	6.56	5.93	331.6	349.6	349.6	56.0	53.3	58.9
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.1	290.9	290.9	58.4	57.6	59.2
Rock	Miss	15056	3333.0	3333.0	384.8	4.55	7.24	4.59	265.8	342.7	342.7	58.4	47.3	74.7
Platte	Miss	15055	4608.6	7941.5	721.8	5.95	15.59	10.61	335.9	823.0	823.0	56.4	52.8	77.5
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	51.78	51.78	0.0	3730.4	3730.4		72.0	72.0
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.74	6.24	3.78	204.6	275.9	275.9	54.7	44.2	73.1
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.25	3.11	1.28	97.4	150.5	150.5	77.7	48.4	117.5
Round	Mille	1020400	636.3	1653.1	290.7	0.62	3.94	1.93	58.2	266.8	266.8	94.0	67.8	138.3
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.71	0.25	14.5	27.7	27.7	58.8	39.1	109.2
Kenney	Mille	18001900	223.4	449.4	56.3	0.28	0.92	0.53	20.5	59.5	59.5	74.4	64.4	111.2
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	11.6	17.9	17.9	62.8	44.2	95.3
Turtle	Mille	18004700	299.4	299.4	50.7	0.38	0.74	0.39	21.5	31.7	31.7	56.5	43.0	82.0
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.16	12.5	27.4	27.4	79.8	40.4	166.7
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	8.0	17.0	17.0	51.0	36.1	104.8
Borden	Mille	18002000	3955.5	6824.0	533.8	5.30	12.41	8.72	315.8	842.8	842.8	59.5	67.9	96.6
Smith	Mille	18002800	1392.1	1392.1	253.0	1.76	3.53	1.79	103.4	154.0	154.0	58.7	43.6	86.3
Camp	Mille	18001800	2542.2	2542.2	275.9	3.48	5.41	3.51	224.5	279.7	279.7	64.5	51.7	79.7
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.26	5.80	33.3	480.4	480.4	66.9	76.7	82.9
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.86	4.23	3.86	241.8	252.6	252.6	62.7	59.7	65.4
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	3.04	3.04	3.04	182.8	182.8	182.8	60.1	60.1	60.1
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.39	18.53	18.43	700.7	886.4	886.4	45.5	47.8	48.1
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.56	1.28	0.57	39.7	60.2	60.2	70.6	47.1	105.0
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.92	2.92	146.5	206.6	206.6	62.4	70.8	70.8
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	168.5	168.5	168.5	60.4	60.4	60.4
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	393.9	393.9	393.9	59.5	59.5	59.5
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.07	4.20	4.07	247.2	250.9	250.9	60.7	59.7	61.6
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.69	6.69	6.69	414.2	414.2	414.2	62.0	62.0	62.0
Groundhou	MilleE	21017	1383.9	1383.9	0.0	2.09	2.09	2.09	127.1	127.1	127.1	60.7	60.7	60.7
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.64	467.96	97.78	3705.2	18734.6	1827.6	139.1	40.0	18.7
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	27.6	38.8	38.8	61.4	46.2	85.0
Ogechie	Rum	21012	3234.9	111226.8	189.1	4.62	104.18	102.88	285.6	2189.8	2189.8	61.8	21.0	21.3
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	110.84	108.42	334.8	2594.8	2594.8	60.8	23.4	23.9
Onamia	Rum	21015	3175.8	118395.5	444.1	4.28	115.81	112.74	296.2	2979.8	2979.8	69.3	25.7	26.4
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	146.4	146.4	146.4	62.9	62.9	62.9
Rum B	Rum	21018	5488.9	125411.1	0.0	8.42	123.49	123.49	540.3	3666.5	3666.5	64.2	29.7	29.7
Rum C	Rum	21013	8139.6	8139.6	0.0	12.29	12.29	12.29	742.1	742.1	742.1	60.4	60.4	60.4
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	135.78	135.78	0.0	4408.6	4408.6		32.5	32.5
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	187.56	187.56	0.0	8139.0	8139.0		43.4	43.4

Alternative: Exist **No Build - Existing Land Use** **Contaminant: Total P**

Road BMPs: Yes **Urban BMP's: No** **Precip: 0.7 m/yr**

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	Basin	Code	Segment	Cumulative	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	12.02	26.99	12.24	791.0	1218.6	195.2	65.8	45.1	16.0
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.08	6.95	376.9	409.8	239.6	54.4	50.7	34.5
Grave	Miss	10109	2901.2	2901.2	93.3	4.33	4.99	4.34	252.9	271.5	165.1	58.4	54.5	38.0
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.70	4.01	3.71	198.2	206.9	153.1	53.5	51.6	41.3
Skunk	Miss	15024	3965.8	3965.8	90.3	5.92	6.56	5.93	331.6	349.6	240.0	56.0	53.3	40.5
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.1	290.9	260.9	58.4	57.6	53.1
Rock	Miss	15056	3333.0	3333.0	384.8	4.55	7.24	4.59	265.8	342.7	97.5	58.4	47.3	21.2
Platte	Miss	15055	4608.6	7941.5	721.8	5.95	15.59	10.61	335.9	577.7	190.0	56.4	37.0	17.9
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	51.78	51.78	0.0	1603.9	1603.9		31.0	31.0
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.74	6.24	3.78	204.6	275.9	72.0	54.7	44.2	19.1
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.25	3.11	1.28	97.4	150.5	20.9	77.7	48.4	16.3
Round	Mille	1020400	636.3	1653.1	290.7	0.62	3.94	1.93	58.2	137.2	24.9	94.0	34.9	12.9
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.71	0.25	14.5	27.7	3.2	58.8	39.1	12.4
Kenney	Mille	18001900	223.4	449.4	56.3	0.28	0.92	0.53	20.5	34.9	8.4	74.4	37.8	15.7
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	11.6	17.9	3.0	62.8	44.2	15.8
Turtle	Mille	18004700	299.4	299.4	50.7	0.38	0.74	0.39	21.5	31.7	6.4	56.5	43.0	16.6
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.16	12.5	27.4	1.9	79.8	40.4	11.4
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	8.0	17.0	1.8	51.0	36.1	11.3
Borden	Mille	18002000	3955.5	6824.0	533.8	5.30	12.41	8.72	315.8	468.9	165.3	59.5	37.8	19.0
Smith	Mille	18002800	1392.1	1392.1	253.0	1.76	3.53	1.79	103.4	154.0	29.3	58.7	43.6	16.4
Camp	Mille	18001800	2542.2	2542.2	275.9	3.48	5.41	3.51	224.5	279.7	83.2	64.5	51.7	23.7
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.26	5.80	33.3	159.3	118.1	66.9	25.4	20.4
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.86	4.23	3.86	241.8	252.6	178.1	62.7	59.7	46.1
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	3.04	3.04	3.04	182.8	182.8	182.8	60.1	60.1	60.1
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.39	18.53	18.43	700.7	886.4	866.2	45.5	47.8	47.0
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.56	1.28	0.57	39.7	60.2	9.5	70.6	47.1	16.5
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.92	2.92	146.5	155.9	155.9	62.4	53.4	53.4
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	168.5	168.5	168.5	60.4	60.4	60.4
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	393.9	393.9	393.9	59.5	59.5	59.5
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.07	4.20	4.07	247.2	250.9	221.3	60.7	59.7	54.3
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.69	6.69	6.69	414.2	414.2	414.2	62.0	62.0	62.0
Groundhou	MilleE	21017	1383.9	1383.9	0.0	2.09	2.09	2.09	127.1	127.1	127.1	60.7	60.7	60.7
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.64	467.96	97.78	3705.2	17315.8	1689.2	139.1	37.0	17.3
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	27.6	38.8	8.3	61.4	46.2	18.3
Ogechie	Rum	21012	3234.9	111226.8	189.1	4.62	104.18	102.88	285.6	2020.9	1915.3	61.8	19.4	18.6
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	110.84	108.42	334.8	2320.3	2114.8	60.8	20.9	19.5
Onamia	Rum	21015	3175.8	118395.5	444.1	4.28	115.81	112.74	296.2	2499.8	2235.6	69.3	21.6	19.8
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	146.4	146.4	146.4	62.9	62.9	62.9
Rum B	Rum	21018	5488.9	125411.1	0.0	8.42	123.49	123.49	540.3	2922.3	2922.3	64.2	23.7	23.7
Rum C	Rum	21013	8139.6	8139.6	0.0	12.29	12.29	12.29	742.1	742.1	742.1	60.4	60.4	60.4
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	135.78	135.78	0.0	3664.4	3664.4		27.0	27.0
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	187.56	187.56	0.0	5268.4	5268.4		28.1	28.1

Appendix A **Alternative: Exist** **No Build - Existing Land Use** **Contaminant: Total P** **A-6**

Road BMPs: Yes **Urban BMP's: Yes** **Precip: 0.7 m/yr**

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	Basin	Code	Segment	Cumulative	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	12.02	26.99	12.24	791.0	1218.6	195.2	65.8	45.1	16.0
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.08	6.95	376.9	409.8	239.6	54.4	50.7	34.5
Grave	Miss	10109	2901.2	2901.2	93.3	4.33	4.99	4.34	252.9	271.5	165.1	58.4	54.5	38.0
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.70	4.01	3.71	198.2	206.9	153.1	53.5	51.6	41.3
Skunk	Miss	15024	3965.8	3965.8	90.3	5.92	6.56	5.93	331.6	349.6	240.0	56.0	53.3	40.5
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.1	290.9	260.9	58.4	57.6	53.1
Rock	Miss	15056	3333.0	3333.0	384.8	4.55	7.24	4.59	265.8	342.7	97.5	58.4	47.3	21.2
Platte	Miss	15055	4608.6	7941.5	721.8	5.95	15.59	10.61	335.9	577.7	190.0	56.4	37.0	17.9
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	51.78	51.78	0.0	1603.9	1603.9		31.0	31.0
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.74	6.24	3.78	204.6	275.9	72.0	54.7	44.2	19.1
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.25	3.11	1.28	97.4	150.5	20.9	77.7	48.4	16.3
Round	Mille	1020400	636.3	1653.1	290.7	0.62	3.94	1.93	58.2	137.2	24.9	94.0	34.9	12.9
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.71	0.25	14.5	27.7	3.2	58.8	39.1	12.4
Kenney	Mille	18001900	223.4	449.4	56.3	0.28	0.92	0.53	20.5	34.9	8.4	74.4	37.8	15.7
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	11.6	17.9	3.0	62.8	44.2	15.8
Turtle	Mille	18004700	299.4	299.4	50.7	0.38	0.74	0.39	21.5	31.7	6.4	56.5	43.0	16.6
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.16	12.5	27.4	1.9	79.8	40.4	11.4
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	8.0	17.0	1.8	51.0	36.1	11.3
Borden	Mille	18002000	3955.5	6824.0	533.8	5.30	12.41	8.72	315.8	468.9	165.3	59.5	37.8	19.0
Smith	Mille	18002800	1392.1	1392.1	253.0	1.76	3.53	1.79	103.4	154.0	29.3	58.7	43.6	16.4
Camp	Mille	18001800	2542.2	2542.2	275.9	3.48	5.41	3.51	224.5	279.7	83.2	64.5	51.7	23.7
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.26	5.80	33.3	159.3	118.1	66.9	25.4	20.4
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.86	4.23	3.86	241.8	252.6	178.1	62.7	59.7	46.1
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	3.04	3.04	3.04	182.8	182.8	182.8	60.1	60.1	60.1
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.39	18.53	18.43	700.7	886.4	866.2	45.5	47.8	47.0
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.56	1.28	0.57	39.7	60.2	9.5	70.6	47.1	16.5
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.92	2.92	146.5	155.9	155.9	62.4	53.4	53.4
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	168.5	168.5	168.5	60.4	60.4	60.4
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	393.9	393.9	393.9	59.5	59.5	59.5
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.07	4.20	4.07	247.2	250.9	221.3	60.7	59.7	54.3
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.69	6.69	6.69	414.2	414.2	414.2	62.0	62.0	62.0
Groundhous	MilleE	21017	1383.9	1383.9	0.0	2.09	2.09	2.09	127.1	127.1	127.1	60.7	60.7	60.7
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.64	467.96	97.78	3705.2	17315.8	1689.2	139.1	37.0	17.3
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	27.6	38.8	8.3	61.4	46.2	18.3
Ogechie	Rum	21012	3234.9	111226.8	189.1	4.62	104.18	102.88	285.6	2020.9	1915.3	61.8	19.4	18.6
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	110.84	108.42	334.8	2320.3	2114.8	60.8	20.9	19.5
Onamia	Rum	21015	3175.8	118395.5	444.1	4.28	115.81	112.74	296.2	2499.8	2235.6	69.3	21.6	19.8
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	146.4	146.4	146.4	62.9	62.9	62.9
Rum B	Rum	21018	5488.9	125411.1	0.0	8.42	123.49	123.49	540.3	2922.3	2922.3	64.2	23.7	23.7
Rum C	Rum	21013	8139.6	8139.6	0.0	12.29	12.29	12.29	742.1	742.1	742.1	60.4	60.4	60.4
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	135.78	135.78	0.0	3664.4	3664.4		27.0	27.0
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	187.56	187.56	0.0	5268.4	5268.4		28.1	28.1

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (mt/yr)			Concentrations (ppm)		
Segment	Basin	Code	Segment	Cumulative	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	12.02	26.99	12.24	327.4	327.4	2.3	27.2	12.1	0.2
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.08	6.95	167.9	167.9	8.4	24.2	20.8	1.2
Grave	Miss	10109	2901.2	2901.2	93.3	4.33	4.99	4.34	109.5	109.5	6.0	25.3	22.0	1.4
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	72.6	72.6	72.6	23.6	23.6	23.6
JackPine	Miss	10120	2489.8	2489.8	43.5	3.70	4.01	3.71	88.9	88.9	8.6	24.0	22.2	2.3
Skunk	Miss	15024	3965.8	3965.8	90.3	5.92	6.56	5.93	146.0	146.0	11.1	24.6	22.3	1.9
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	124.3	124.3	30.6	25.3	24.6	6.2
Rock	Miss	15056	3333.0	3333.0	384.8	4.55	7.24	4.59	115.0	115.0	1.7	25.3	15.9	0.4
Platte	Miss	15055	4608.6	7941.5	721.8	5.95	15.59	10.61	147.4	149.1	2.7	24.8	9.6	0.3
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	51.78	51.78	0.0	142.3	142.3		2.7	2.7
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.74	6.24	3.78	90.9	90.9	1.2	24.3	14.6	0.3
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.25	3.11	1.28	38.1	38.1	0.2	30.4	12.2	0.2
Round	Mille	1020400	636.3	1653.1	290.7	0.62	3.94	1.93	21.5	21.7	0.2	34.6	5.5	0.1
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.71	0.25	6.3	6.3	0.0	25.4	8.8	0.1
Kenney	Mille	18001900	223.4	449.4	56.3	0.28	0.92	0.53	8.1	8.1	0.1	29.5	8.8	0.2
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	4.9	4.9	0.0	26.5	12.1	0.2
Turtle	Mille	18004700	299.4	299.4	50.7	0.38	0.74	0.39	9.4	9.4	0.1	24.8	12.8	0.2
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.16	4.9	4.9	0.0	30.9	7.2	0.1
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	3.7	3.7	0.0	23.3	7.8	0.1
Borden	Mille	18002000	3955.5	6824.0	533.8	5.30	12.41	8.72	135.7	136.1	2.7	25.6	11.0	0.3
Smith	Mille	18002800	1392.1	1392.1	253.0	1.76	3.53	1.79	44.7	44.7	0.4	25.4	12.6	0.2
Camp	Mille	18001800	2542.2	2542.2	275.9	3.48	5.41	3.51	86.7	86.7	1.4	24.9	16.0	0.4
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.26	5.80	12.7	14.5	1.4	25.6	2.3	0.2
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.86	4.23	3.86	94.3	94.3	7.7	24.4	22.3	2.0
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	3.04	3.04	3.04	72.2	72.2	72.2	23.7	23.7	23.7
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.39	18.53	18.43	95.2	167.4	103.3	6.2	9.0	5.6
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.56	1.28	0.57	15.0	15.0	0.1	26.6	11.7	0.2
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.92	2.92	57.1	57.2	57.2	24.4	19.6	19.6
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	66.4	66.4	66.4	23.8	23.8	23.8
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	156.0	156.0	156.0	23.6	23.6	23.6
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.07	4.20	4.07	97.3	97.3	21.3	23.9	23.2	5.2
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.69	6.69	6.69	162.0	162.0	162.0	24.2	24.2	24.2
Groundhou	MilleE	21017	1383.9	1383.9	0.0	2.09	2.09	2.09	50.0	50.0	50.0	23.9	23.9	23.9
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.47	467.79	97.61	781.9	1411.2	6.4	29.5	3.0	0.1
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	10.8	10.8	0.1	24.1	12.9	0.2
Ogechie	Rum	21012	3234.9	111226.8	189.1	4.62	104.01	102.71	111.8	118.3	47.8	24.2	1.1	0.5
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	110.67	108.25	131.7	179.5	49.9	23.9	1.6	0.5
Onamia	Rum	21015	3175.8	118395.5	444.1	4.28	115.64	112.57	112.1	162.1	39.0	26.2	1.4	0.3
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	57.0	57.0	57.0	24.5	24.5	24.5
Rum B	Rum	21018	5488.9	125411.1	0.0	8.42	123.32	123.32	209.1	305.1	305.1	24.8	2.5	2.5
Rum C	Rum	21013	8139.6	8139.6	0.0	12.29	12.29	12.29	292.5	292.5	292.5	23.8	23.8	23.8
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	135.61	135.61	0.0	597.7	597.7		4.4	4.4
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	187.39	187.39	0.0	739.9	739.9		3.9	3.9

Road BMPs: No **Urban BMP's: No** **Precip: 0.87 m/yr**

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (mt/yr)			Concentrations (ppm)		
Segment	Basin	Code	Segment	Cumulative	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	20.42	39.02	24.27	406.9	406.9	5.7	19.9	10.4	0.2
Nokay	Miss	10107	4726.3	4726.3	164.6	11.96	13.39	12.26	208.7	208.7	17.8	17.4	15.6	1.4
Grave	Miss	10109	2901.2	2901.2	93.3	7.43	8.25	7.60	136.1	136.1	12.6	18.3	16.5	1.7
Noname A	Miss	10110	2044.8	2044.8	0.0	5.33	5.33	5.33	90.3	90.3	90.3	16.9	16.9	16.9
JackPine	Miss	10120	2489.8	2489.8	43.5	6.40	6.78	6.48	110.5	110.5	17.3	17.3	16.3	2.7
Skunk	Miss	15024	3965.8	3965.8	90.3	10.20	10.99	10.36	181.4	181.4	22.8	17.8	16.5	2.2
Noname B	Miss	15025	3203.6	3203.6	18.8	8.43	8.60	8.47	154.5	154.5	55.6	18.3	18.0	6.6
Rock	Miss	15056	3333.0	3333.0	384.8	7.81	11.15	8.50	143.0	143.0	3.8	18.3	12.8	0.5
Platte	Miss	15055	4608.6	7941.5	721.8	10.24	25.02	20.04	183.2	187.0	6.3	17.9	7.5	0.3
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	94.80	94.80	0.0	228.2	228.2		2.4	2.4
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	6.45	9.56	7.09	113.0	113.0	2.7	17.5	11.8	0.4
BigPine	Mille	1015700	1016.8	1016.8	265.2	2.09	4.40	2.57	47.3	47.3	0.6	22.6	10.8	0.2
Round	Mille	1020400	636.3	1653.1	290.7	1.01	6.11	4.11	26.7	27.2	0.5	26.4	4.5	0.1
Scott	Mille	18003300	226.0	226.0	66.0	0.42	1.00	0.54	7.8	7.8	0.1	18.4	7.8	0.1
Kenney	Mille	18001900	223.4	449.4	56.3	0.46	1.49	1.11	10.1	10.2	0.2	21.9	6.8	0.2
Miller	Mille	18002100	149.4	149.4	31.6	0.32	0.59	0.37	6.1	6.1	0.1	19.3	10.3	0.2
Turtle	Mille	18004700	299.4	299.4	50.7	0.66	1.10	0.75	11.7	11.7	0.2	17.9	10.7	0.3
Partridge	Mille	18004800	167.6	167.6	74.4	0.26	0.91	0.40	6.0	6.0	0.0	23.1	6.6	0.1
Chrysler	Mille	18009500	149.6	149.6	44.7	0.27	0.66	0.35	4.6	4.6	0.0	16.7	6.9	0.1
Borden	Mille	18002000	3955.5	6824.0	533.8	9.09	20.81	17.13	168.6	169.7	6.5	18.6	8.2	0.4
Smith	Mille	18002800	1392.1	1392.1	253.0	3.02	5.22	3.47	55.5	55.5	0.9	18.4	10.6	0.3
Camp	Mille	18001800	2542.2	2542.2	275.9	5.98	8.38	6.48	107.8	107.8	3.1	18.0	12.9	0.5
Holt	Mille	18002900	388.2	4322.4	67.4	0.85	11.39	10.93	15.8	19.8	3.3	18.6	1.7	0.3
Twenty	MilleE	1008500	2584.9	2584.9	53.9	6.65	7.12	6.75	117.1	117.1	15.8	17.6	16.5	2.3
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	5.26	5.26	5.26	89.7	89.7	89.7	17.0	17.0	17.0
Thaines	MilleE	21003	2614.7	4631.3	14.3	18.25	23.64	23.54	118.3	208.0	140.1	6.5	8.8	5.9
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.96	1.85	1.14	18.6	18.6	0.3	19.4	10.1	0.2
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	4.04	5.19	5.19	71.0	71.3	71.3	17.6	13.7	13.7
Seventeen	MilleE	21006	1845.7	1845.7	0.0	4.82	4.82	4.82	82.5	82.5	82.5	17.1	17.1	17.1
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	11.46	11.46	11.46	193.9	193.9	193.9	16.9	16.9	16.9
Malmo	MilleE	21008	2711.6	2711.6	18.2	7.04	7.20	7.07	120.9	120.9	39.6	17.2	16.8	5.6
Peterson	MilleE	21010	4399.4	4399.4	0.0	11.53	11.53	11.53	201.3	201.3	201.3	17.5	17.5	17.5
Groundhou	MilleE	21017	1383.9	1383.9	0.0	3.62	3.62	3.62	62.2	62.2	62.2	17.2	17.2	17.2
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	44.41	620.29	250.10	971.8	1791.1	20.6	21.9	2.9	0.1
Twelve	Rum	49000600	352.5	352.5	55.6	0.78	1.26	0.88	13.5	13.5	0.3	17.3	10.7	0.3
Ogechie	Rum	21012	3234.9	111226.8	189.1	7.98	260.61	259.30	139.0	159.9	101.0	17.4	0.6	0.4
Shakopee	Rum	21014	3992.9	115219.7	351.2	9.52	271.88	269.45	163.7	264.6	129.5	17.2	1.0	0.5
Onamia	Rum	21015	3175.8	118395.5	444.1	7.30	280.62	277.55	139.4	268.9	117.9	19.1	1.0	0.4
Rum A	Rum	21016	1526.6	1526.6	0.0	4.01	4.01	4.01	70.9	70.9	70.9	17.7	17.7	17.7
Rum B	Rum	21018	5488.9	125411.1	0.0	14.47	296.04	296.04	259.9	448.7	448.7	18.0	1.5	1.5
Rum C	Rum	21013	8139.6	8139.6	0.0	21.25	21.25	21.25	363.6	363.6	363.6	17.1	17.1	17.1
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	317.30	317.30	0.0	812.3	812.3		2.6	2.6
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	412.10	412.10	0.0	1040.5	1040.5		2.5	2.5

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (mt/yr)			Concentrations (ppm)		
Segment	**Basin**	**Code**	**Segment**	**Cumulative**	**Area (ha)**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**
Bay	Miss	10035	9704.3	9704.3	2138.2	12.02	26.99	12.24	42.4	42.4	42.4	3.5	1.6	3.5
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.08	6.95	17.3	17.3	17.3	2.5	2.1	2.5
Grave	Miss	10109	2901.2	2901.2	93.3	4.33	4.99	4.34	107.2	107.2	107.2	24.7	21.5	24.7
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	4.2	4.2	4.2	1.4	1.4	1.4
JackPine	Miss	10120	2489.8	2489.8	43.5	3.70	4.01	3.71	54.3	54.3	54.3	14.7	13.5	14.6
Skunk	Miss	15024	3965.8	3965.8	90.3	5.92	6.56	5.93	41.9	41.9	41.9	7.1	6.4	7.1
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	47.7	47.7	47.7	9.7	9.5	9.7
Rock	Miss	15056	3333.0	3333.0	384.8	4.55	7.24	4.59	105.3	105.3	105.3	23.1	14.5	22.9
Platte	Miss	15055	4608.6	7941.5	721.8	5.95	15.59	10.61	14.1	119.4	119.4	2.4	7.7	11.3
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	51.78	51.78	0.0	434.5	434.5		8.4	8.4
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.74	6.24	3.78	38.9	38.9	38.9	10.4	6.2	10.3
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.25	3.11	1.28	3.1	3.1	3.1	2.5	1.0	2.4
Round	Mille	1020400	636.3	1653.1	290.7	0.62	3.94	1.93	0.0	3.1	3.1	0.0	0.8	1.6
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.71	0.25	0.0	0.0	0.0	0.0	0.0	0.0
Kenney	Mille	18001900	223.4	449.4	56.3	0.28	0.92	0.53	3.2	3.2	3.2	11.5	3.4	5.9
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	0.0	0.0	0.0	0.0	0.0	0.0
Turtle	Mille	18004700	299.4	299.4	50.7	0.38	0.74	0.39	0.0	0.0	0.0	0.0	0.0	0.0
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.16	0.0	0.0	0.0	0.0	0.0	0.0
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	0.0	0.0	0.0	0.0	0.0	0.0
Borden	Mille	18002000	3955.5	6824.0	533.8	5.30	12.41	8.72	45.1	51.4	51.4	8.5	4.1	5.9
Smith	Mille	18002800	1392.1	1392.1	253.0	1.76	3.53	1.79	27.0	27.0	27.0	15.3	7.7	15.1
Camp	Mille	18001800	2542.2	2542.2	275.9	3.48	5.41	3.51	49.0	49.0	49.0	14.1	9.1	14.0
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.26	5.80	0.0	76.0	76.0	0.0	12.1	13.1
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.86	4.23	3.86	16.4	16.4	16.4	4.3	3.9	4.3
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	3.04	3.04	3.04	4.6	4.6	4.6	1.5	1.5	1.5
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.39	18.53	18.43	12.2	16.8	16.8	0.8	0.9	0.9
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.56	1.28	0.57	7.1	7.1	7.1	12.6	5.6	12.4
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.92	2.92	9.4	16.5	16.5	4.0	5.6	5.6
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	5.2	5.2	5.2	1.9	1.9	1.9
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	5.9	5.9	5.9	0.9	0.9	0.9
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.07	4.20	4.07	8.8	8.8	8.8	2.2	2.1	2.2
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.69	6.69	6.69	23.2	23.2	23.2	3.5	3.5	3.5
Groundhou	MilleE	21017	1383.9	1383.9	0.0	2.09	2.09	2.09	4.6	4.6	4.6	2.2	2.2	2.2
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.47	467.79	97.61	389.1	652.7	652.7	14.7	1.4	6.7
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	2.8	2.8	2.8	6.2	3.3	6.1
Ogechie	Rum	21012	3234.9	111226.8	189.1	4.62	104.01	102.71	73.1	728.6	728.6	15.8	7.0	7.1
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	110.67	108.25	58.4	787.0	787.0	10.6	7.1	7.3
Onamia	Rum	21015	3175.8	118395.5	444.1	4.28	115.64	112.57	125.2	912.2	912.2	29.3	7.9	8.1
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	16.0	16.0	16.0	6.9	6.9	6.9
Rum B	Rum	21018	5488.9	125411.1	0.0	8.42	123.32	123.32	27.5	955.7	955.7	3.3	7.7	7.7
Rum C	Rum	21013	8139.6	8139.6	0.0	12.29	12.29	12.29	64.9	64.9	64.9	5.3	5.3	5.3
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	135.61	135.61	0.0	1020.6	1020.6		7.5	7.5
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	187.39	187.39	0.0	1455.1	1455.1		7.8	7.8

Road BMPs: No | Urban BMP's: No | Precip: 0.87 m/yr

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (mt/yr)			Concentrations (ppm)		
Segment	Basin	Code	Segment	Cumulative	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	20.42	39.02	24.27	42.4	42.4	42.4	2.1	1.1	1.7
Nokay	Miss	10107	4726.3	4726.3	164.6	11.96	13.39	12.26	17.3	17.3	17.3	1.4	1.3	1.4
Grave	Miss	10109	2901.2	2901.2	93.3	7.43	8.25	7.60	107.2	107.2	107.2	14.4	13.0	14.1
Noname A	Miss	10110	2044.8	2044.8	0.0	5.33	5.33	5.33	4.2	4.2	4.2	0.8	0.8	0.8
JackPine	Miss	10120	2489.8	2489.8	43.5	6.40	6.78	6.48	54.3	54.3	54.3	8.5	8.0	8.4
Skunk	Miss	15024	3965.8	3965.8	90.3	10.20	10.99	10.36	41.9	41.9	41.9	4.1	3.8	4.0
Noname B	Miss	15025	3203.6	3203.6	18.8	8.43	8.60	8.47	47.7	47.7	47.7	5.7	5.6	5.6
Rock	Miss	15056	3333.0	3333.0	384.8	7.81	11.15	8.50	105.3	105.3	105.3	13.5	9.4	12.4
Platte	Miss	15055	4608.6	7941.5	721.8	10.24	25.02	20.04	14.1	119.4	119.4	1.4	4.8	6.0
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	94.80	94.80	0.0	434.5	434.5		4.6	4.6
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	6.45	9.56	7.09	38.9	38.9	38.9	6.0	4.1	5.5
BigPine	Mille	1015700	1016.8	1016.8	265.2	2.09	4.40	2.57	3.1	3.1	3.1	1.5	0.7	1.2
Round	Mille	1020400	636.3	1653.1	290.7	1.01	6.11	4.11	0.0	3.1	3.1	0.0	0.5	0.7
Scott	Mille	18003300	226.0	226.0	66.0	0.42	1.00	0.54	0.0	0.0	0.0	0.0	0.0	0.0
Kenney	Mille	18001900	223.4	449.4	56.3	0.46	1.49	1.11	3.2	3.2	3.2	6.9	2.1	2.9
Miller	Mille	18002100	149.4	149.4	31.6	0.32	0.59	0.37	0.0	0.0	0.0	0.0	0.0	0.0
Turtle	Mille	18004700	299.4	299.4	50.7	0.66	1.10	0.75	0.0	0.0	0.0	0.0	0.0	0.0
Partridge	Mille	18004800	167.6	167.6	74.4	0.26	0.91	0.40	0.0	0.0	0.0	0.0	0.0	0.0
Chrysler	Mille	18009500	149.6	149.6	44.7	0.27	0.66	0.35	0.0	0.0	0.0	0.0	0.0	0.0
Borden	Mille	18002000	3955.5	6824.0	533.8	9.09	20.81	17.13	45.1	51.4	51.4	5.0	2.5	3.0
Smith	Mille	18002800	1392.1	1392.1	253.0	3.02	5.22	3.47	27.0	27.0	27.0	8.9	5.2	7.8
Camp	Mille	18001800	2542.2	2542.2	275.9	5.98	8.38	6.48	49.0	49.0	49.0	8.2	5.8	7.6
Holt	Mille	18002900	388.2	4322.4	67.4	0.85	11.39	10.93	0.0	76.0	76.0	0.0	6.7	7.0
Twenty	MilleE	1008500	2584.9	2584.9	53.9	6.65	7.12	6.75	16.4	16.4	16.4	2.5	2.3	2.4
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	5.26	5.26	5.26	4.6	4.6	4.6	0.9	0.9	0.9
Thaines	MilleE	21003	2614.7	4631.3	14.3	18.25	23.64	23.54	12.2	16.8	16.8	0.7	0.7	0.7
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.96	1.85	1.14	7.1	7.1	7.1	7.4	3.8	6.2
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	4.04	5.19	5.19	9.4	16.5	16.5	2.3	3.2	3.2
Seventeen	MilleE	21006	1845.7	1845.7	0.0	4.82	4.82	4.82	5.2	5.2	5.2	1.1	1.1	1.1
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	11.46	11.46	11.46	5.9	5.9	5.9	0.5	0.5	0.5
Malmo	MilleE	21008	2711.6	2711.6	18.2	7.04	7.20	7.07	8.8	8.8	8.8	1.2	1.2	1.2
Peterson	MilleE	21010	4399.4	4399.4	0.0	11.53	11.53	11.53	23.2	23.2	23.2	2.0	2.0	2.0
Groundhous	MilleE	21017	1383.9	1383.9	0.0	3.62	3.62	3.62	4.6	4.6	4.6	1.3	1.3	1.3
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	44.41	620.29	250.10	389.1	652.7	652.7	8.8	1.1	2.6
Twelve	Rum	49000600	352.5	352.5	55.6	0.78	1.26	0.88	2.8	2.8	2.8	3.6	2.2	3.2
Ogechie	Rum	21012	3234.9	111226.8	189.1	7.98	260.61	259.30	73.1	728.6	728.6	9.2	2.8	2.8
Shakopee	Rum	21014	3992.9	115219.7	351.2	9.52	271.88	269.45	58.4	787.0	787.0	6.1	2.9	2.9
Onamia	Rum	21015	3175.8	118395.5	444.1	7.30	280.62	277.55	125.2	912.2	912.2	17.1	3.3	3.3
Rum A	Rum	21016	1526.6	1526.6	0.0	4.01	4.01	4.01	16.0	16.0	16.0	4.0	4.0	4.0
Rum B	Rum	21018	5488.9	125411.1	0.0	14.47	296.04	296.04	27.5	955.7	955.7	1.9	3.2	3.2
Rum C	Rum	21013	8139.6	8139.6	0.0	21.25	21.25	21.25	64.9	64.9	64.9	3.1	3.1	3.1
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	317.30	317.30	0.0	1020.6	1020.6		3.2	3.2
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	412.10	412.10	0.0	1455.1	1455.1		3.5	3.5

Road BMPs: No | Urban BMP's: No | Precip: 0.7 m/yr

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (rel)			Concentrations (rel)		
Segment	Basin	Code	Segment	Cumulative	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	12.02	26.99	12.24	1771.2	1771.2	25.0	147.3	65.6	2.0
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.08	6.95	482.3	482.3	46.0	69.6	59.7	6.6
Grave	Miss	10109	2901.2	2901.2	93.3	4.33	4.99	4.34	1125.6	1125.6	117.4	259.8	225.8	27.0
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	10.8	10.8	10.8	3.5	3.5	3.5
JackPine	Miss	10120	2489.8	2489.8	43.5	3.70	4.01	3.71	165.8	165.8	29.1	44.8	41.4	7.9
Skunk	Miss	15024	3965.8	3965.8	90.3	5.92	6.56	5.93	269.1	269.1	38.0	45.4	41.0	6.4
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	491.5	491.5	194.1	100.0	97.4	39.5
Rock	Miss	15056	3333.0	3333.0	384.8	4.55	7.24	4.59	850.3	850.3	24.6	186.9	117.4	5.4
Platte	Miss	15055	4608.6	7941.5	721.8	5.95	15.59	10.61	90.6	115.2	4.1	15.2	7.4	0.4
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	51.78	51.78	0.0	464.5	464.5		9.0	9.0
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.74	6.24	3.78	377.1	377.1	9.7	100.8	60.4	2.6
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.25	3.11	1.28	181.7	181.7	2.2	144.9	58.4	1.7
Round	Mille	1020400	636.3	1653.1	290.7	0.62	3.94	1.93	0.0	2.2	0.0	0.0	0.6	0.0
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.71	0.25	0.0	0.0	0.0	0.0	0.0	0.0
Kenney	Mille	18001900	223.4	449.4	56.3	0.28	0.92	0.53	256.0	256.0	5.9	930.3	277.3	11.1
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	0.0	0.0	0.0	0.0	0.0	0.0
Turtle	Mille	18004700	299.4	299.4	50.7	0.38	0.74	0.39	0.0	0.0	0.0	0.0	0.0	0.0
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.16	0.0	0.0	0.0	0.0	0.0	0.0
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	0.0	0.0	0.0	0.0	0.0	0.0
Borden	Mille	18002000	3955.5	6824.0	533.8	5.30	12.41	8.72	2453.6	2459.6	96.5	462.6	198.3	11.1
Smith	Mille	18002800	1392.1	1392.1	253.0	1.76	3.53	1.79	104.0	104.0	1.8	59.1	29.5	1.0
Camp	Mille	18001800	2542.2	2542.2	275.9	3.48	5.41	3.51	376.9	376.9	11.6	108.3	69.6	3.3
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.26	5.80	0.0	13.4	2.4	0.0	2.1	0.4
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.86	4.23	3.86	188.4	188.4	28.6	48.8	44.5	7.4
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	3.04	3.04	3.04	52.9	52.9	52.9	17.4	17.4	17.4
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.39	18.53	18.43	139.9	192.8	147.2	9.1	10.4	8.0
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.56	1.28	0.57	81.5	81.5	1.1	144.7	63.7	2.0
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.92	2.92	107.6	108.7	108.7	45.9	37.2	37.2
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	59.7	59.7	59.7	21.4	21.4	21.4
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	67.2	67.2	67.2	10.1	10.1	10.1
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.07	4.20	4.07	100.7	100.7	36.2	24.7	24.0	8.9
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.69	6.69	6.69	266.8	266.8	266.8	39.9	39.9	39.9
Groundhou	MilleE	21017	1383.9	1383.9	0.0	2.09	2.09	2.09	52.2	52.2	52.2	25.0	25.0	25.0
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.47	467.79	97.61	32336.1	33211.3	299.4	1221.5	71.0	3.1
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	16.0	16.0	0.3	35.6	19.1	0.7
Ogechie	Rum	21012	3234.9	111226.8	189.1	4.62	104.01	102.71	1451.2	1750.9	1008.2	313.8	16.8	9.8
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	110.67	108.25	262.3	1270.5	552.9	47.6	11.5	5.1
Onamia	Rum	21015	3175.8	118395.5	444.1	4.28	115.64	112.57	5118.4	5671.3	2199.8	1197.0	49.0	19.5
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	925.0	925.0	925.0	397.2	397.2	397.2
Rum B	Rum	21018	5488.9	125411.1	0.0	8.42	123.32	123.32	1586.8	4711.6	4711.6	188.5	38.2	38.2
Rum C	Rum	21013	8139.6	8139.6	0.0	12.29	12.29	12.29	1069.2	1069.2	1069.2	87.0	87.0	87.0
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	135.61	135.61	0.0	5780.9	5780.9		42.6	42.6
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	187.39	187.39	0.0	6245.4	6245.4		33.3	33.3

Road BMPs: No | Urban BMP's: No | Precip: 0.87 m/yr

nt Mass Balances		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (rel)			Concentrations (rel)		
Segment	Basin	Code	Segment	Cumulative	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	20.42	39.02	24.27	1771.2	1771.2	48.9	86.7	45.4	2.0
Nokay	Miss	10107	4726.3	4726.3	164.6	11.96	13.39	12.26	482.3	482.3	75.7	40.3	36.0	6.2
Grave	Miss	10109	2901.2	2901.2	93.3	7.43	8.25	7.60	1125.6	1125.6	190.6	151.4	136.5	25.1
Noname A	Miss	10110	2044.8	2044.8	0.0	5.33	5.33	5.33	10.8	10.8	10.8	2.0	2.0	2.0
JackPine	Miss	10120	2489.8	2489.8	43.5	6.40	6.78	6.48	165.8	165.8	45.0	25.9	24.5	6.9
Skunk	Miss	15024	3965.8	3965.8	90.3	10.20	10.99	10.36	269.1	269.1	60.0	26.4	24.5	5.8
Noname B	Miss	15025	3203.6	3203.6	18.8	8.43	8.60	8.47	491.5	491.5	260.1	58.3	57.2	30.7
Rock	Miss	15056	3333.0	3333.0	384.8	7.81	11.15	8.50	850.3	850.3	44.5	108.9	76.2	5.2
Platte	Miss	15055	4608.6	7941.5	721.8	10.24	25.02	20.04	90.6	135.1	8.8	8.8	5.4	0.4
Mississippi	Miss	1	0.0	36977.4	0.0	0.00	94.80	94.80	0.0	699.8	699.8		7.4	7.4
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	6.45	9.56	7.09	377.1	377.1	17.9	58.4	39.5	2.5
BigPine	Mille	1015700	1016.8	1016.8	265.2	2.09	4.40	2.57	181.7	181.7	4.3	86.7	41.3	1.7
Round	Mille	1020400	636.3	1653.1	290.7	1.01	6.11	4.11	0.0	4.3	0.1	0.0	0.7	0.0
Scott	Mille	18003300	226.0	226.0	66.0	0.42	1.00	0.54	0.0	0.0	0.0	0.0	0.0	0.0
Kenney	Mille	18001900	223.4	449.4	56.3	0.46	1.49	1.11	256.0	256.0	12.0	554.5	171.3	10.8
Miller	Mille	18002100	149.4	149.4	31.6	0.32	0.59	0.37	0.0	0.0	0.0	0.0	0.0	0.0
Turtle	Mille	18004700	299.4	299.4	50.7	0.66	1.10	0.75	0.0	0.0	0.0	0.0	0.0	0.0
Partridge	Mille	18004800	167.6	167.6	74.4	0.26	0.91	0.40	0.0	0.0	0.0	0.0	0.0	0.0
Chrysler	Mille	18009500	149.6	149.6	44.7	0.27	0.66	0.35	0.0	0.0	0.0	0.0	0.0	0.0
Borden	Mille	18002000	3955.5	6824.0	533.8	9.09	20.81	17.13	2453.6	2465.8	183.1	270.0	118.5	10.7
Smith	Mille	18002800	1392.1	1392.1	253.0	3.02	5.22	3.47	104.0	104.0	3.5	34.5	19.9	1.0
Camp	Mille	18001800	2542.2	2542.2	275.9	5.98	8.38	6.48	376.9	376.9	20.9	63.0	45.0	3.2
Holt	Mille	18002900	388.2	4322.4	67.4	0.85	11.39	10.93	0.0	24.3	7.0	0.0	2.1	0.6
Twenty	MilleE	1008500	2584.9	2584.9	53.9	6.65	7.12	6.75	188.4	188.4	44.9	28.3	26.5	6.7
Upper Malo	MilleE	21004	2016.6	2016.6	0.0	5.26	5.26	5.26	52.9	52.9	52.9	10.0	10.0	10.0
Thaines	MilleE	21003	2614.7	4631.3	14.3	18.25	23.64	23.54	139.9	192.8	155.1	7.7	8.2	6.6
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.96	1.85	1.14	81.5	81.5	2.2	84.9	44.1	1.9
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	4.04	5.19	5.19	107.6	109.8	109.8	26.6	21.2	21.2
Seventeen	MilleE	21006	1845.7	1845.7	0.0	4.82	4.82	4.82	59.7	59.7	59.7	12.4	12.4	12.4
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	11.46	11.46	11.46	67.2	67.2	67.2	5.9	5.9	5.9
Malmo	MilleE	21008	2711.6	2711.6	18.2	7.04	7.20	7.07	100.7	100.7	49.7	14.3	14.0	7.0
Peterson	MilleE	21010	4399.4	4399.4	0.0	11.53	11.53	11.53	266.8	266.8	266.8	23.1	23.1	23.1
Groundhou	MilleE	21017	1383.9	1383.9	0.0	3.62	3.62	3.62	52.2	52.2	52.2	14.4	14.4	14.4
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	44.41	620.29	250.10	32336.1	33349.5	759.6	728.2	53.8	3.0
Twelve	Rum	49000600	352.5	352.5	55.6	0.78	1.26	0.88	16.0	16.0	0.6	20.6	12.7	0.7
Ogechie	Rum	21012	3234.9	111226.8	189.1	7.98	260.61	259.30	1451.2	2211.4	1711.9	181.8	8.5	6.6
Shakopee	Rum	21014	3992.9	115219.7	351.2	9.52	271.88	269.45	262.3	1974.2	1297.6	27.6	7.3	4.8
Onamia	Rum	21015	3175.8	118395.5	444.1	7.30	280.62	277.55	5118.4	6416.0	3912.1	701.1	22.9	14.1
Rum A	Rum	21016	1526.6	1526.6	0.0	4.01	4.01	4.01	925.0	925.0	925.0	230.6	230.6	230.6
Rum B	Rum	21018	5488.9	125411.1	0.0	14.47	296.04	296.04	1586.8	6423.9	6423.9	109.6	21.7	21.7
Rum C	Rum	21013	8139.6	8139.6	0.0	21.25	21.25	21.25	1069.2	1069.2	1069.2	50.3	50.3	50.3
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	317.30	317.30	0.0	7493.2	7493.2		23.6	23.6
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	412.10	412.10	0.0	8192.9	8192.9		19.9	19.9

Appendix B

Mass Balance Summaries for Existing Conditions

Cases	Variable	Hydrology	Assumptions
1	Total P	2000 Calibration	
2	Total P	Average Year	
3	Total P	Wet Year	
4	Total P	Average Year	No P Retention in Upstream Lakes
5	Total P	Average Year	BMP's on New Roads
6	Total P	Average Year	BMP's on New Roads & New Urban Areas
7	TSS	Average Year	
8	TSS	Wet Year	
9	Road Salt	Average Year	
10	Road Salt	Wet Year	
11	Traffic Contam.	Average Year	
12	Traffic Contam.	Wet Year	

Note: Page Numbers Correspond to Cases Identified in Tables 9 & 10

Water & Mass Balance Summary **Variable: Total P** **B-1**
Precip: 0.58 m/yr **Alt: Exist** **No Build - Existing Land Use**
Road BMPs: No **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load kg/yr	Conc ppb	Runoff m/yr	Export kg/km2-yr
Sources						
Imperv Runoff	1208	4.9	1276	260	0.41	105.6
Perv Runoff	108221	31.4	3766	120	0.03	3.5
Road Runoff	198	0.8	209	260	0.41	105.6
Base Flow	109628	67.0	2464	37	0.06	2.2
Total Flow	109628	104.1	7715	74	0.09	7.0
Road-Lane Related			0			
Traffic-Related			0			
Net Atmospheric	60900	-67.0	12180			20.0
Total Nonpoint	170528	37.1	19895	537	0.02	11.7
Point Sources		0.2	51	300		
Septic Tanks			1500			
Total Sources	170528	37.2	21446	576	0.02	12.6
Total Retention			19574			
Net Outflow	170528	37.2	1872	50	0.02	1.1
Mille Lacs Lake						
WhiteFish	2816	1.6	27.4	17	0.06	1.0
Borden	6824	3.2	55.7	17	0.05	0.8
Holt	4322	2.5	42.6	17	0.06	1.0
Twenty	2585	2.0	92.5	46	0.08	3.6
Thaines	4631	15.2	711.7	47	0.33	15.4
Cedar Ck	2000	1.5	97.0	66	0.07	4.9
Seventeen	1846	1.5	107.0	72	0.08	5.8
Ditch 36	4399	3.5	248.5	70	0.08	5.6
Malmo	2712	2.2	128.5	59	0.08	4.7
Peterson	4399	3.6	265.5	74	0.08	6.0
Groundhouse	1384	1.1	80.8	72	0.08	5.8
Total Tributaries	37919	37.9	1857	49	0.10	4.9
Direct Drainage	16071	15.0	1508	100	0.09	9.4
Total Watershed	53989	52.9	3365	64	0.10	6.2
Point Sources		0.2	51			
Septic Tanks			1500			
Rainfall	53650	311.2	10730	34	0.58	20.0
Total Inflow	53650	364.2	15646	43	0.68	29.2
Evaporation	53650	370.2			0.69	
Retention		-6.0	15646			
Outflow	107639	0.0	0	17	0.00	0.0
Exported from Region						
Rum Riv Basin	133551	19.3	1053	55	0.01	0.8
Mississippi Riv Basin	36977	23.9	820	34	0.06	2.2
Total Export	170528	43.2	1872	43	0.03	1.1

Water & Mass Balance Summary **Variable: Total P** **B-2**

Precip: 0.7 m/yr **Alt: Exist** **No Build - Existing Land Use**

Road BMPs: No **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load kg/yr	Conc ppb	Runoff m/yr	Export kg/km2-yr
Sources						
Imperv Runoff	1208	5.9	1539	260	0.49	127.4
Perv Runoff	108221	37.9	4545	120	0.04	4.2
Road Runoff	198	1.0	252	260	0.49	127.4
Base Flow	109628	136.5	4978	36	0.12	4.5
Total Flow	109628	181.3	11315	62	0.17	10.3
Road-Lane Related			0			
Traffic-Related			0			
Net Atmospheric	60900	6.1	12180			20.0
Total Nonpoint	170528	187.4	23495	125	0.11	13.8
Point Sources		0.2	51	300		
Septic Tanks			1500			
Total Sources	170528	187.6	25046	134	0.11	14.7
Total Retention			19778			
Net Outflow	170528	187.6	5268	28	0.11	3.1
Mille Lacs Lake						
WhiteFish	2816	3.8	72.0	19	0.13	2.6
Borden	6824	8.7	165.3	19	0.13	2.4
Holt	4322	5.8	118.1	20	0.13	2.7
Twenty	2585	3.9	178.1	46	0.15	6.9
Thaines	4631	18.4	866.2	47	0.40	18.7
Cedar Ck	2000	2.9	155.9	53	0.15	7.8
Seventeen	1846	2.8	168.5	60	0.15	9.1
Ditch 36	4399	6.6	393.9	60	0.15	9.0
Malmo	2712	4.1	221.3	54	0.15	8.2
Peterson	4399	6.7	414.2	62	0.15	9.4
Groundhouse	1384	2.1	127.1	61	0.15	9.2
Total Tributaries	37919	65.8	2881	44	0.17	7.6
Direct Drainage	16071	26.5	2154	81	0.16	13.4
Total Watershed	53989	92.2	5035	55	0.17	9.3
Point Sources		0.2	51			
Septic Tanks			1500			
Rainfall	53650	375.6	10730	29	0.70	20.0
Total Inflow	53650	468.0	17316	37	0.87	32.3
Evaporation	53650	370.2			0.69	
Retention		0.0	15627			
Outflow	107639	97.8	1689	17	0.09	1.6
Exported from Region						
Rum Riv Basin	133551	135.8	3664	27	0.10	2.7
Mississippi Riv Basin	36977	51.8	1604	31	0.14	4.3
Total Export	170528	187.6	5268	28	0.11	3.1

Water & Mass Balance Summary **Variable: Total P** **B-3**

Precip: 0.87 m/yr **Alt: Exist** **No Build - Existing Land Use**

Road BMPs: No **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load kg/yr	Conc ppb	Runoff m/yr	Export kg/km2-yr
Sources						
Imperv Runoff	1208	7.4	1913	260	0.61	158.3
Perv Runoff	108221	47.1	5649	120	0.04	5.2
Road Runoff	198	1.2	313	260	0.61	158.3
Base Flow	109628	246.8	8964	36	0.23	8.2
Total Flow	109628	302.5	16840	56	0.28	15.4
Road-Lane Related			0			
Traffic-Related			0			
Net Atmospheric	60900	109.6	12180			20.0
Total Nonpoint	170528	412.1	29020	70	0.24	17.0
Point Sources		0.2	51	300		
Septic Tanks			1500			
Total Sources	170528	412.3	30571	74	0.24	17.9
Total Retention			20093			
Net Outflow	170528	412.3	10478	25	0.24	6.1
Mille Lacs Lake						
WhiteFish	2816	7.1	151.4	21	0.25	5.4
Borden	6824	17.1	352.3	21	0.25	5.2
Holt	4322	10.9	256.6	23	0.25	5.9
Twenty	2585	6.7	311.0	46	0.26	12.0
Thaines	4631	23.5	1105.2	47	0.51	23.9
Cedar Ck	2000	5.2	249.0	48	0.26	12.4
Seventeen	1846	4.8	263.6	55	0.26	14.3
Ditch 36	4399	11.5	618.9	54	0.26	14.1
Malmo	2712	7.1	362.1	51	0.26	13.4
Peterson	4399	11.5	643.8	56	0.26	14.6
Groundhouse	1384	3.6	198.6	55	0.26	14.3
Total Tributaries	37919	109.1	4512	41	0.29	11.9
Direct Drainage	16071	44.4	3138	71	0.28	19.5
Total Watershed	53989	153.5	7650	50	0.28	14.2
Point Sources		0.2	51			
Septic Tanks			1500			
Rainfall	53650	466.8	10730	23	0.87	20.0
Total Inflow	53650	620.5	19931	32	1.16	37.2
Evaporation	53650	370.2			0.69	
Retention		0.0	15612			
Outflow	107639	250.3	4320	17	0.23	4.0
Exported from Region						
Rum Riv Basin	133551	317.5	7609	24	0.24	5.7
Mississippi Riv Basin	36977	94.8	2870	30	0.26	7.8
Total Export	170528	412.3	10478	25	0.24	6.1

Water & Mass Balance Summary **Variable: Total P** **B-4**
Precip: 0.7 m/yr **Alt: Exist** **No Build - Existing Land Use**
Road BMPs: No **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load kg/yr	Conc ppb	Runoff m/yr	Export kg/km2-yr
Sources						
Imperv Runoff	1208	5.9	1539	260	0.49	127.4
Perv Runoff	108221	37.9	4545	120	0.04	4.2
Road Runoff	198	1.0	252	260	0.49	127.4
Base Flow	109628	136.5	4978	36	0.12	4.5
Total Flow	109628	181.3	11315	62	0.17	10.3
Road-Lane Related			0			
Traffic-Related			0			
Net Atmospheric	60900	6.1	12180			20.0
Total Nonpoint	170528	187.4	23495	125	0.11	13.8
Point Sources		0.2	51	300		
Septic Tanks			1500			
Total Sources	170528	187.6	25046	134	0.11	14.7
Total Retention			16907			
Net Outflow	170528	187.6	8139	43	0.11	4.8
Mille Lacs Lake						
WhiteFish	2816	3.8	275.9	73	0.13	9.8
Borden	6824	8.7	842.8	97	0.13	12.4
Holt	4322	5.8	480.4	83	0.13	11.1
Twenty	2585	3.9	252.6	65	0.15	9.8
Thaines	4631	18.4	886.4	48	0.40	19.1
Cedar Ck	2000	2.9	206.6	71	0.15	10.3
Seventeen	1846	2.8	168.5	60	0.15	9.1
Ditch 36	4399	6.6	393.9	60	0.15	9.0
Malmo	2712	4.1	250.9	62	0.15	9.3
Peterson	4399	6.7	414.2	62	0.15	9.4
Groundhouse	1384	2.1	127.1	61	0.15	9.2
Total Tributaries	37919	65.8	4299	65	0.17	11.3
Direct Drainage	16071	26.5	2154	81	0.16	13.4
Total Watershed	53989	92.2	6454	70	0.17	12.0
Point Sources		0.2	51			
Septic Tanks			1500			
Rainfall	53650	375.6	10730	29	0.70	20.0
Total Inflow	53650	468.0	18735	40	0.87	34.9
Evaporation	53650	370.2			0.69	
Retention		0.0	16907			
Outflow	107639	97.8	1828	19	0.09	1.7
Exported from Region						
Rum Riv Basin	133551	135.8	4409	32	0.10	3.3
Mississippi Riv Basin	36977	51.8	3730	72	0.14	10.1
Total Export	170528	187.6	8139	43	0.11	4.8

Water & Mass Balance Summary **Variable: Total P** **B-5**

Precip: 0.7 m/yr **Alt: Exist** **No Build - Existing Land Use**

Road BMPs: Yes **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load kg/yr	Conc ppb	Runoff m/yr	Export kg/km2-yr
Sources						
Imperv Runoff	1208	5.9	1539	260	0.49	127.4
Perv Runoff	108221	37.9	4545	120	0.04	4.2
Road Runoff	198	1.0	252	260	0.49	127.4
Base Flow	109628	136.5	4978	36	0.12	4.5
Total Flow	109628	181.3	11315	62	0.17	10.3
Road-Lane Related			0			
Traffic-Related			0			
Net Atmospheric	60900	6.1	12180			20.0
Total Nonpoint	170528	187.4	23495	125	0.11	13.8
Point Sources		0.2	51	300		
Septic Tanks			1500			
Total Sources	170528	187.6	25046	134	0.11	14.7
Total Retention			19778			
Net Outflow	170528	187.6	5268	28	0.11	3.1
Mille Lacs Lake						
WhiteFish	2816	3.8	72.0	19	0.13	2.6
Borden	6824	8.7	165.3	19	0.13	2.4
Holt	4322	5.8	118.1	20	0.13	2.7
Twenty	2585	3.9	178.1	46	0.15	6.9
Thaines	4631	18.4	866.2	47	0.40	18.7
Cedar Ck	2000	2.9	155.9	53	0.15	7.8
Seventeen	1846	2.8	168.5	60	0.15	9.1
Ditch 36	4399	6.6	393.9	60	0.15	9.0
Malmo	2712	4.1	221.3	54	0.15	8.2
Peterson	4399	6.7	414.2	62	0.15	9.4
Groundhouse	1384	2.1	127.1	61	0.15	9.2
Total Tributaries	37919	65.8	2881	44	0.17	7.6
Direct Drainage	16071	26.5	2154	81	0.16	13.4
Total Watershed	53989	92.2	5035	55	0.17	9.3
Point Sources		0.2	51			
Septic Tanks			1500			
Rainfall	53650	375.6	10730	29	0.70	20.0
Total Inflow	53650	468.0	17316	37	0.87	32.3
Evaporation	53650	370.2			0.69	
Retention		0.0	15627			
Outflow	107639	97.8	1689	17	0.09	1.6
Exported from Region						
Rum Riv Basin	133551	135.8	3664	27	0.10	2.7
Mississippi Riv Basin	36977	51.8	1604	31	0.14	4.3
Total Export	170528	187.6	5268	28	0.11	3.1

Water & Mass Balance Summary **Variable: Total P** **B-6**
Precip: 0.7 m/yr **Alt: Exist** **No Build - Existing Land Use**
Road BMPs: Yes **Urban BMP's: Yes**

	Area ha	Flow hm3/yr	Load kg/yr	Conc ppb	Runoff m/yr	Export kg/km2-yr
Sources						
Imperv Runoff	1208	5.9	1539	260	0.49	127.4
Perv Runoff	108221	37.9	4545	120	0.04	4.2
Road Runoff	198	1.0	252	260	0.49	127.4
Base Flow	109628	136.5	4978	36	0.12	4.5
Total Flow	109628	181.3	11315	62	0.17	10.3
Road-Lane Related			0			
Traffic-Related			0			
Net Atmospheric	60900	6.1	12180			20.0
Total Nonpoint	170528	187.4	23495	125	0.11	13.8
Point Sources		0.2	51	300		
Septic Tanks			1500			
Total Sources	170528	187.6	25046	134	0.11	14.7
Total Retention			19778			
Net Outflow	170528	187.6	5268	28	0.11	3.1
Mille Lacs Lake						
WhiteFish	2816	3.8	72.0	19	0.13	2.6
Borden	6824	8.7	165.3	19	0.13	2.4
Holt	4322	5.8	118.1	20	0.13	2.7
Twenty	2585	3.9	178.1	46	0.15	6.9
Thaines	4631	18.4	866.2	47	0.40	18.7
Cedar Ck	2000	2.9	155.9	53	0.15	7.8
Seventeen	1846	2.8	168.5	60	0.15	9.1
Ditch 36	4399	6.6	393.9	60	0.15	9.0
Malmo	2712	4.1	221.3	54	0.15	8.2
Peterson	4399	6.7	414.2	62	0.15	9.4
Groundhouse	1384	2.1	127.1	61	0.15	9.2
Total Tributaries	37919	65.8	2881	44	0.17	7.6
Direct Drainage	16071	26.5	2154	81	0.16	13.4
Total Watershed	53989	92.2	5035	55	0.17	9.3
Point Sources		0.2	51			
Septic Tanks			1500			
Rainfall	53650	375.6	10730	29	0.70	20.0
Total Inflow	53650	468.0	17316	37	0.87	32.3
Evaporation	53650	370.2			0.69	
Retention		0.0	15627			
Outflow	107639	97.8	1689	17	0.09	1.6
Exported from Region						
Rum Riv Basin	133551	135.8	3664	27	0.10	2.7
Mississippi Riv Basin	36977	51.8	1604	31	0.14	4.3
Total Export	170528	187.6	5268	28	0.11	3.1

Water & Mass Balance Summary **Variable: Susp. Solids** **B-7**
Precip: 0.7 m/yr **Alt: Exist** **No Build - Existing Land Use**
Road BMPs: No **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load mt/yr	Conc ppm	Runoff m/yr	Export mt/km2-yr
Sources						
Imperv Runoff	1208	5.9	474	80	0.49	39.2
Perv Runoff	108221	37.9	3788	100	0.04	3.5
Road Runoff	198	1.0	78	80	0.49	39.2
Base Flow	109628	136.5	0	0	0.12	0.0
Total Flow	109628	181.3	4339	24	0.17	4.0
Road-Lane Related			0			
Traffic-Related			0			
Net Atmospheric	60900	6.1	0			0.0
Total Nonpoint	170528	187.4	4339	23	0.11	2.5
Point Sources		0.0	0			
Septic Tanks			0			
Total Sources	170528	187.4	4339	23	0.11	2.5
Total Retention			3599			
Net Outflow	170528	187.4	740	4	0.11	0.4
Mille Lacs Lake						
WhiteFish	2816	3.8	1.2	0	0.13	0.0
Borden	6824	8.7	2.7	0	0.13	0.0
Holt	4322	5.8	1.4	0	0.13	0.0
Twenty	2585	3.9	7.7	2	0.15	0.3
Thaines	4631	18.4	103.3	6	0.40	2.2
Cedar Ck	2000	2.9	57.2	20	0.15	2.9
Seventeen	1846	2.8	66.4	24	0.15	3.6
Ditch 36	4399	6.6	156.0	24	0.15	3.5
Malmo	2712	4.1	21.3	5	0.15	0.8
Peterson	4399	6.7	162.0	24	0.15	3.7
Groundhouse	1384	2.1	50.0	24	0.15	3.6
Total Tributaries	37919	65.8	629	10	0.17	1.7
Direct Drainage	16071	26.5	782	30	0.16	4.9
Total Watershed	53989	92.2	1411	15	0.17	2.6
Point Sources		0.0	0			
Septic Tanks			0			
Rainfall	53650	375.6	0	0	0.70	0.0
Total Inflow	53650	467.8	1411	3	0.87	2.6
Evaporation	53650	370.2			0.69	
Retention		0.0	1405			
Outflow	107639	97.6	6	0	0.09	0.0
Exported from Region						
Rum Riv Basin	133551	135.6	598	4	0.10	0.4
Mississippi Riv Basin	36977	51.8	142	3	0.14	0.4
Total Export	170528	187.4	740	4	0.11	0.4

Water & Mass Balance Summary **Variable: Susp. Solids** **B-8**
Precip: 0.87 m/yr **Alt: Exist** **No Build - Existing Land Use**
Road BMPs: No **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load mt/yr	Conc ppm	Runoff m/yr	Export mt/km2-yr
Sources						
Imperv Runoff	1208	7.4	589	80	0.61	48.7
Perv Runoff	108221	47.1	4708	100	0.04	4.4
Road Runoff	198	1.2	96	80	0.61	48.7
Base Flow	109628	246.8	0	0	0.23	0.0
Total Flow	109628	302.5	5393	18	0.28	4.9
Road-Lane Related			0			
Traffic-Related			0			
Net Atmospheric	60900	109.6	0			0.0
Total Nonpoint	170528	412.1	5393	13	0.24	3.2
Point Sources		0.0	0			
Septic Tanks			0			
Total Sources	170528	412.1	5393	13	0.24	3.2
Total Retention			4352			
Net Outflow	170528	412.1	1041	3	0.24	0.6
Mille Lacs Lake						
WhiteFish	2816	7.1	2.7	0	0.25	0.1
Borden	6824	17.1	6.5	0	0.25	0.1
Holt	4322	10.9	3.3	0	0.25	0.1
Twenty	2585	6.7	15.8	2	0.26	0.6
Thaines	4631	23.5	140.1	6	0.51	3.0
Cedar Ck	2000	5.2	71.3	14	0.26	3.6
Seventeen	1846	4.8	82.5	17	0.26	4.5
Ditch 36	4399	11.5	193.9	17	0.26	4.4
Malmo	2712	7.1	39.6	6	0.26	1.5
Peterson	4399	11.5	201.3	17	0.26	4.6
Groundhouse	1384	3.6	62.2	17	0.26	4.5
Total Tributaries	37919	109.1	819	8	0.29	2.2
Direct Drainage	16071	44.4	972	22	0.28	6.0
Total Watershed	53989	153.5	1791	12	0.28	3.3
Point Sources		0.0	0			
Septic Tanks			0			
Rainfall	53650	466.8	0	0	0.87	0.0
Total Inflow	53650	620.3	1791	3	1.16	3.3
Evaporation	53650	370.2			0.69	
Retention		0.0	1770			
Outflow	107639	250.1	21	0	0.23	0.0
Exported from Region						
Rum Riv Basin	133551	317.3	812	3	0.24	0.6
Mississippi Riv Basin	36977	94.8	228	2	0.26	0.6
Total Export	170528	412.1	1041	3	0.24	0.6

Water & Mass Balance Summary **Variable: Road Salt** **B-9**

Precip: 0.7 m/yr **Alt: Exist** **No Build - Existing Land Use**

Road BMPs: No **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load mt/yr	Conc ppm	Runoff m/yr	Export mt/km2-yr
Sources						
Imperv Runoff	1208	5.9	0	0	0.49	0.0
Perv Runoff	108221	37.9	0	0	0.04	0.0
Road Runoff	198	1.0	0	0	0.49	0.0
Base Flow	109628	136.5	0	0	0.12	0.0
Total Flow	109628	181.3	0	0	0.17	0.0
Road-Lane Related			1455			
Traffic-Related			0			
Net Atmospheric	60900	6.1	0			0.0
Total Nonpoint	170528	187.4	1455	8	0.11	0.9
Point Sources		0.0	0			
Septic Tanks			0			
Total Sources	170528	187.4	1455	8	0.11	0.9
Total Retention			0			
Net Outflow	170528	187.4	1455	8	0.11	0.9
Mille Lacs Lake						
WhiteFish	2816	3.8	38.9	10	0.13	1.4
Borden	6824	8.7	51.4	6	0.13	0.8
Holt	4322	5.8	76.0	13	0.13	1.8
Twenty	2585	3.9	16.4	4	0.15	0.6
Thaines	4631	18.4	16.8	1	0.40	0.4
Cedar Ck	2000	2.9	16.5	6	0.15	0.8
Seventeen	1846	2.8	5.2	2	0.15	0.3
Ditch 36	4399	6.6	5.9	1	0.15	0.1
Malmo	2712	4.1	8.8	2	0.15	0.3
Peterson	4399	6.7	23.2	3	0.15	0.5
Groundhouse	1384	2.1	4.6	2	0.15	0.3
Total Tributaries	37919	65.8	264	4	0.17	0.7
Direct Drainage	16071	26.5	389	15	0.16	2.4
Total Watershed	53989	92.2	653	7	0.17	1.2
Point Sources		0.0	0			
Septic Tanks			0			
Rainfall	53650	375.6	0	0	0.70	0.0
Total Inflow	53650	467.8	653	1	0.87	1.2
Evaporation	53650	370.2			0.69	
Retention		0.0	0			
Outflow	107639	97.6	653	7	0.09	0.6
Exported from Region						
Rum Riv Basin	133551	135.6	1021	8	0.10	0.8
Mississippi Riv Basin	36977	51.8	434	8	0.14	1.2
Total Export	170528	187.4	1455	8	0.11	0.9

Water & Mass Balance Summary **Variable: Road Salt** **B-10**
Precip: 0.87 m/yr **Alt: Exist** **No Build - Existing Land Use**
Road BMPs: No **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load mt/yr	Conc ppm	Runoff m/yr	Export mt/km2-yr
Sources						
Imperv Runoff	1208	7.4	0	0	0.61	0.0
Perv Runoff	108221	47.1	0	0	0.04	0.0
Road Runoff	198	1.2	0	0	0.61	0.0
Base Flow	109628	246.8	0	0	0.23	0.0
Total Flow	109628	302.5	0	0	0.28	0.0
Road-Lane Related			1455			
Traffic-Related			0			
Net Atmospheric	60900	109.6	0			0.0
Total Nonpoint	170528	412.1	1455	4	0.24	0.9
Point Sources		0.0	0			
Septic Tanks			0			
Total Sources	170528	412.1	1455	4	0.24	0.9
Total Retention			0			
Net Outflow	170528	412.1	1455	4	0.24	0.9
Mille Lacs Lake						
WhiteFish	2816	7.1	38.9	5	0.25	1.4
Borden	6824	17.1	51.4	3	0.25	0.8
Holt	4322	10.9	76.0	7	0.25	1.8
Twenty	2585	6.7	16.4	2	0.26	0.6
Thaines	4631	23.5	16.8	1	0.51	0.4
Cedar Ck	2000	5.2	16.5	3	0.26	0.8
Seventeen	1846	4.8	5.2	1	0.26	0.3
Ditch 36	4399	11.5	5.9	1	0.26	0.1
Malmo	2712	7.1	8.8	1	0.26	0.3
Peterson	4399	11.5	23.2	2	0.26	0.5
Groundhouse	1384	3.6	4.6	1	0.26	0.3
Total Tributaries	37919	109.1	264	2	0.29	0.7
Direct Drainage	16071	44.4	389	9	0.28	2.4
Total Watershed	53989	153.5	653	4	0.28	1.2
Point Sources		0.0	0			
Septic Tanks			0			
Rainfall	53650	466.8	0	0	0.87	0.0
Total Inflow	53650	620.3	653	1	1.16	1.2
Evaporation	53650	370.2			0.69	
Retention		0.0	0			
Outflow	107639	250.1	653	3	0.23	0.6
Exported from Region						
Rum Riv Basin	133551	317.3	1021	3	0.24	0.8
Mississippi Riv Basin	36977	94.8	434	5	0.26	1.2
Total Export	170528	412.1	1455	4	0.24	0.9

Water & Mass Balance Summary **Variable: Traffic** **B-11**
Precip: 0.7 m/yr **Alt: Exist** **No Build - Existing Land Use**
Road BMPs: No **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load rel	Conc rel	Runoff m/yr	Export rel
Sources						
Imperv Runoff	1208	5.9	0	0	0.49	0.0
Perv Runoff	108221	37.9	0	0	0.04	0.0
Road Runoff	198	1.0	0	0	0.49	0.0
Base Flow	109628	136.5	0	0	0.12	0.0
Total Flow	109628	181.3	0	0	0.17	0.0
Road-Lane Related			0			
Traffic-Related			52888			
Net Atmospheric	60900	6.1	0			0.0
Total Nonpoint	170528	187.4	52888	282	0.11	31.0
Point Sources		0.0	0			
Septic Tanks			0			
Total Sources	170528	187.4	52888	282	0.11	31.0
Total Retention			46643			
Net Outflow	170528	187.4	6245	33	0.11	3.7
Mille Lacs Lake						
WhiteFish	2816	3.8	9.7	3	0.13	0.3
Borden	6824	8.7	96.5	11	0.13	1.4
Holt	4322	5.8	2.4	0	0.13	0.1
Twenty	2585	3.9	28.6	7	0.15	1.1
Thaines	4631	18.4	147.2	8	0.40	3.2
Cedar Ck	2000	2.9	108.7	37	0.15	5.4
Seventeen	1846	2.8	59.7	21	0.15	3.2
Ditch 36	4399	6.6	67.2	10	0.15	1.5
Malmo	2712	4.1	36.2	9	0.15	1.3
Peterson	4399	6.7	266.8	40	0.15	6.1
Groundhouse	1384	2.1	52.2	25	0.15	3.8
Total Tributaries	37919	65.8	875	13	0.17	2.3
Direct Drainage	16071	26.5	32336	1222	0.16	201.2
Total Watershed	53989	92.2	33211	360	0.17	61.5
Point Sources		0.0	0			
Septic Tanks			0			
Rainfall	53650	375.6	0	0	0.70	0.0
Total Inflow	53650	467.8	33211	71	0.87	61.9
Evaporation	53650	370.2			0.69	
Retention		0.0	32912			
Outflow	107639	97.6	299	3	0.09	0.3
Exported from Region						
Rum Riv Basin	133551	135.6	5781	43	0.10	4.3
Mississippi Riv Basin	36977	51.8	464	9	0.14	1.3
Total Export	170528	187.4	6245	33	0.11	3.7

Water & Mass Balance Summary **Variable: Traffic** **B-12**

Precip: 0.87 m/yr **Alt: Exist** **No Build - Existing Land Use**

Road BMPs: No **Urban BMP's: No**

	Area ha	Flow hm3/yr	Load rel	Conc rel	Runoff m/yr	Export rel
Sources						
Imperv Runoff	1208	7.4	0	0	0.61	0.0
Perv Runoff	108221	47.1	0	0	0.04	0.0
Road Runoff	198	1.2	0	0	0.61	0.0
Base Flow	109628	246.8	0	0	0.23	0.0
Total Flow	109628	302.5	0	0	0.28	0.0
Road-Lane Related			0			
Traffic-Related			52888			
Net Atmospheric	60900	109.6	0			0.0
Total Nonpoint	170528	412.1	52888	128	0.24	31.0
Point Sources		0.0	0			
Septic Tanks			0			
Total Sources	170528	412.1	52888	128	0.24	31.0
Total Retention			44696			
Net Outflow	170528	412.1	8193	20	0.24	4.8
Mille Lacs Lake						
WhiteFish	2816	7.1	17.9	3	0.25	0.6
Borden	6824	17.1	183.1	11	0.25	2.7
Holt	4322	10.9	7.0	1	0.25	0.2
Twenty	2585	6.7	44.9	7	0.26	1.7
Thaines	4631	23.5	155.1	7	0.51	3.3
Cedar Ck	2000	5.2	109.8	21	0.26	5.5
Seventeen	1846	4.8	59.7	12	0.26	3.2
Ditch 36	4399	11.5	67.2	6	0.26	1.5
Malmo	2712	7.1	49.7	7	0.26	1.8
Peterson	4399	11.5	266.8	23	0.26	6.1
Groundhouse	1384	3.6	52.2	14	0.26	3.8
Total Tributaries	37919	109.1	1013	9	0.29	2.7
Direct Drainage	16071	44.4	32336	728	0.28	201.2
Total Watershed	53989	153.5	33349	217	0.28	61.8
Point Sources		0.0	0			
Septic Tanks			0			
Rainfall	53650	466.8	0	0	0.87	0.0
Total Inflow	53650	620.3	33349	54	1.16	62.2
Evaporation	53650	370.2			0.69	
Retention		0.0	32590			
Outflow	107639	250.1	760	3	0.23	0.7
Exported from Region						
Rum Riv Basin	133551	317.3	7493	24	0.24	5.6
Mississippi Riv Basin	36977	94.8	700	7	0.26	1.9
Total Export	170528	412.1	8193	20	0.24	4.8

Appendix C

Concentration Increases Relative to Existing Conditions

Page/Case	Variable	Hydrology	Assumptions
1	Total P	2000 Calibration	
2	Total P	Average Year	
3	Total P	Wet Year	
4	Total P	Average Year	No P Retention in Upstream Lakes
5	Total P	Average Year	BMP's on New Roads
6	Total P	Average Year	BMP's on New Roads & New Urban Areas
7	TSS	Average Year	
8	TSS	Wet Year	
9	Road Salt	Average Year	
10	Road Salt	Wet Year	
11	Traffic Contam.	Average Year	
12	Traffic Contam.	Wet Year	

Note: Page Numbers Correspond to Cases Identified in Tables 9 & 10

Concentration Increases Relative to Existing Condition

C-1

Variable: Total P **Units:** ppb **Precip:** 0.58 m/yr

Road BMPs: No **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	**Basin**	**Exist**	**NoBld**	**Alt-2**	**Alt-2A**	**Alt-3**	**Alt-4**	**Alt-5**
Bay	Miss	14.3752	0.3681	0.2808	0.2584	0.1882	0.6402	0.5649
Nokay	Miss	33.5595	0.0930	0.0531	0.0530	0.0555	0.0523	0.0539
Grave	Miss	37.8408	0.7263	0.4202	0.4153	0.4344	1.9239	1.6050
Noname A	Miss	64.0412	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JackPine	Miss	43.2869	0.9875	0.5679	0.5628	0.5863	4.7273	4.1640
Skunk	Miss	41.5675	0.0816	0.0468	0.0468	0.0469	0.0468	0.0469
Noname B	Miss	62.0517	0.0238	0.0132	0.0132	0.1721	0.0132	0.1721
Rock	Miss	18.9998	1.0989	0.6553	0.6508	0.6760	3.0963	2.7591
Platte	Miss	15.7009	0.1815	0.1061	0.1049	0.1091	0.3280	0.2977
Mississippi Total	Miss	34.2444	0.1599	0.0896	0.0891	0.1148	0.5412	0.4885
WhiteFish	Mille	16.9002	1.3510	1.1311	1.5167	1.4381	2.4060	2.2694
BigPine	Mille	14.8069	0.6596	0.4327	0.4312	0.4430	0.4289	0.4418
Round	Mille	11.7798	0.4514	0.2626	0.2587	0.2716	0.2580	0.2668
Scott	Mille	11.3260	1.4758	0.8823	0.8765	0.9035	1.2764	1.1958
Kenney	Mille	14.5096	2.0040	3.9674	4.0771	3.4311	1.1486	1.1831
Miller	Mille	14.2048	2.1778	1.2541	1.2526	1.2964	1.2387	1.2740
Turtle	Mille	14.7727	1.4774	0.8483	0.8447	0.8766	0.8415	0.8655
Partridge	Mille	10.7414	1.2378	0.7134	0.7092	0.7363	0.7019	0.7273
Chrysler	Mille	10.3227	0.7889	0.4537	0.4503	0.4688	0.4457	0.4588
Borden	Mille	17.4287	1.7132	2.1102	2.1315	1.9458	2.0345	1.9408
Smith	Mille	14.6654	4.0605	3.9110	4.2745	3.8908	3.7481	3.7617
Camp	Mille	20.4145	3.5348	3.0010	2.9881	3.0219	3.3816	3.4018
Holt	Mille	17.3382	2.0739	1.8653	1.9232	1.8573	1.9223	1.9335
Twenty	MilleE	45.7687	0.7560	0.7560	0.7560	0.7560	0.7560	0.7560
Upper Malone	MilleE	71.1003	0.4248	0.4248	0.4248	0.4248	0.4248	0.4248
Thaines	MilleE	46.8942	0.1799	0.1799	0.1799	0.1799	0.1799	0.1799
Cedar Lake	MilleE	14.4333	0.4119	0.4119	0.4119	0.4119	0.4119	0.4119
Cedar Ck	MilleE	66.3814	0.8620	0.8620	0.8620	0.8620	0.8620	0.8620
Seventeen	MilleE	71.5859	0.5216	0.5216	0.5216	0.5216	0.5216	0.5216
Ditch 36	MilleE	70.2283	0.2496	0.2496	0.2496	0.2496	0.2496	0.2496
Malmo	MilleE	59.3866	0.5128	0.5128	0.5128	0.5128	0.5128	0.5128
Peterson	MilleE	73.7986	0.9561	0.9561	0.9561	0.9561	0.9561	0.9561
Groundhouse	MilleE	72.0118	0.6061	0.6061	0.6061	0.6061	0.6061	0.6061
Mille Lacs	Mille	17.2975	0.0266	0.0876	0.0912	0.0534	0.0280	0.0100
Twelve	Rum	15.5696	0.0710	0.0384	0.0384	0.3209	0.0384	0.3157
Ogechie	Rum	27.4769	2.6905	2.5669	2.9350	6.0056	4.2360	5.5552
Shakopee	Rum	22.5412	0.9157	0.8452	0.9244	1.6157	1.2109	1.5120
Onamia	Rum	19.7788	0.7617	0.7855	0.7640	1.2004	0.6451	1.2292
Rum A	Rum	75.1357	2.1052	2.1008	1.6348	0.0053	0.0053	0.0053
Rum B	Rum	45.7956	-0.7607	-0.7980	-0.9241	0.0166	-1.3732	-0.4465
Rum C	Rum	71.5017	0.3267	0.1896	0.1885	2.5267	0.1862	2.0192
Rum Total	Rum	54.5736	-0.8109	-0.8814	-0.9681	0.4131	-1.2769	-0.0612
Net Outflow	Net	43.3158	-0.0776	-0.1383	-0.1763	0.5352	-0.1274	0.4502

Concentration Increases Relative to Existing Condition

C-2

Variable: Total P **Units:** ppb **Precip:** 0.7 m/yr

Road BMPs: No **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	Basin	Exist	NoBld	Alt-2	Alt-2A	Alt-3	Alt-4	Alt-5
Bay	Miss	15.9539	0.3941	0.3007	0.2766	0.2015	0.6854	0.6048
Nokay	Miss	34.4801	0.0800	0.0457	0.0456	0.0477	0.0450	0.0464
Grave	Miss	38.0274	0.6219	0.3597	0.3554	0.3719	1.6490	1.3753
Noname A	Miss	51.9683	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JackPine	Miss	41.2672	0.7820	0.4495	0.4455	0.4640	3.7599	3.3097
Skunk	Miss	40.4531	0.0668	0.0383	0.0383	0.0384	0.0383	0.0384
Noname B	Miss	53.0557	0.0177	0.0098	0.0098	0.1278	0.0098	0.1278
Rock	Miss	21.2447	1.1056	0.6592	0.6546	0.6800	3.1166	2.7769
Platte	Miss	17.9043	0.2485	0.1461	0.1447	0.1504	0.5218	0.4703
Mississippi Total	Miss	30.9759	0.2317	0.1457	0.1408	0.1447	0.6170	0.5515
WhiteFish	Mille	19.0553	1.3724	1.1490	1.5409	1.4610	2.4448	2.3059
BigPine	Mille	16.2912	0.7152	0.4692	0.4675	0.4803	0.4650	0.4791
Round	Mille	12.8830	0.5206	0.3069	0.3027	0.3170	0.3018	0.3120
Scott	Mille	12.4115	1.6127	0.9641	0.9578	0.9873	1.3947	1.3067
Kenney	Mille	15.6911	2.1254	4.0234	4.1321	3.4919	1.2574	1.2843
Miller	Mille	15.8071	2.3238	1.3381	1.3365	1.3833	1.3217	1.3594
Turtle	Mille	16.6045	1.5459	0.8876	0.8838	0.9172	0.8804	0.9056
Partridge	Mille	11.4376	1.3847	0.7981	0.7934	0.8237	0.7852	0.8136
Chrysler	Mille	11.2944	0.8633	0.4965	0.4928	0.5131	0.4877	0.5021
Borden	Mille	18.9545	1.6910	2.0579	2.0789	1.8989	1.9491	1.8634
Smith	Mille	16.4277	4.2780	4.1204	4.5035	4.0991	3.9486	3.9630
Camp	Mille	23.7301	3.5098	2.9792	2.9664	3.0000	3.3574	3.3776
Holt	Mille	20.3768	2.6535	2.3863	2.4698	2.3823	2.4793	2.4928
Twenty	MilleE	46.0957	0.6068	0.6068	0.6068	0.6068	0.6068	0.6068
Upper Malone	MilleE	60.0981	0.2909	0.2909	0.2909	0.2909	0.2909	0.2909
Thaines	MilleE	46.9981	0.1801	0.1801	0.1801	0.1801	0.1801	0.1801
Cedar Lake	MilleE	16.5332	0.4390	0.4390	0.4390	0.4390	0.4390	0.4390
Cedar Ck	MilleE	53.4272	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500
Seventeen	MilleE	60.4306	0.3579	0.3579	0.3579	0.3579	0.3579	0.3579
Ditch 36	MilleE	59.5024	0.1703	0.1703	0.1703	0.1703	0.1703	0.1703
Malmo	MilleE	54.3105	0.3733	0.3733	0.3733	0.3733	0.3733	0.3733
Peterson	MilleE	61.9537	0.6621	0.6621	0.6621	0.6621	0.6621	0.6621
Groundhouse	MilleE	60.7228	0.4166	0.4166	0.4166	0.4166	0.4166	0.4166
Mille Lacs	Mille	17.2758	0.0491	0.1117	0.1161	0.0769	0.0526	0.0340
Twelve	Rum	18.2558	0.0734	0.0396	0.0396	0.3315	0.0396	0.3260
Ogechie	Rum	18.6174	0.3371	0.3776	0.4185	0.7052	0.4990	0.6218
Shakopee	Rum	19.5055	0.2981	0.3248	0.3597	0.6090	0.4305	0.5375
Onamia	Rum	19.8294	0.3302	0.3615	0.3825	0.6422	0.4028	0.5932
Rum A	Rum	62.8804	1.4685	1.4654	1.1394	0.0037	0.0037	0.0037
Rum B	Rum	23.6654	0.3341	0.3489	0.3526	0.7224	0.3299	0.6097
Rum C	Rum	60.3729	0.2240	0.1300	0.1292	1.7397	0.1276	1.3889
Rum Total	Rum	26.9885	0.2886	0.2884	0.2907	0.7900	0.2744	0.6556
Net Outflow	Net	28.0893	0.2669	0.2412	0.2411	0.6040	0.3666	0.6232

Concentration Increases Relative to Existing Condition

Variable: Total P **Units:** ppb **Precip:** 0.87 m/yr

Road BMPs: No **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	**Basin**	**Exist**	**NoBld**	**Alt-2**	**Alt-2A**	**Alt-3**	**Alt-4**	**Alt-5**
Bay	Miss	17.8137	0.4187	0.3194	0.2939	0.2140	0.7282	0.6425
Nokay	Miss	34.9956	0.0687	0.0392	0.0392	0.0410	0.0386	0.0398
Grave	Miss	37.9228	0.5327	0.3081	0.3044	0.3185	1.4139	1.1789
Noname A	Miss	45.7728	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JackPine	Miss	39.6911	0.6327	0.3635	0.3603	0.3753	3.0514	2.6848
Skunk	Miss	39.4172	0.0553	0.0317	0.0317	0.0318	0.0317	0.0318
Noname B	Miss	47.6418	0.0137	0.0076	0.0076	0.0991	0.0076	0.0991
Rock	Miss	23.5403	1.0951	0.6529	0.6483	0.6734	3.0894	2.7524
Platte	Miss	20.3192	0.3090	0.1823	0.1807	0.1878	0.7000	0.6291
Mississippi Total	Miss	30.2690	0.2556	0.1652	0.1587	0.1535	0.6336	0.5645
WhiteFish	Mille	21.3329	1.3733	1.1497	1.5420	1.4620	2.4473	2.3081
BigPine	Mille	18.0678	0.7718	0.5063	0.5045	0.5184	0.5019	0.5170
Round	Mille	14.3581	0.5983	0.3572	0.3528	0.3686	0.3516	0.3633
Scott	Mille	13.7761	1.7567	1.0502	1.0433	1.0754	1.5192	1.4233
Kenney	Mille	17.0970	2.2454	4.0443	4.1505	3.5244	1.3722	1.3897
Miller	Mille	17.6872	2.4592	1.4159	1.4142	1.4637	1.3984	1.4384
Turtle	Mille	18.6755	1.5986	0.9177	0.9138	0.9483	0.9103	0.9363
Partridge	Mille	12.3476	1.5551	0.8964	0.8911	0.9251	0.8818	0.9138
Chrysler	Mille	12.5376	0.9419	0.5417	0.5376	0.5598	0.5321	0.5478
Borden	Mille	20.5709	1.6671	1.9951	2.0155	1.8434	1.8605	1.7830
Smith	Mille	18.4439	4.4600	4.2955	4.6953	4.2733	4.1164	4.1314
Camp	Mille	27.1378	3.4309	2.9117	2.8992	2.9321	3.2818	3.3016
Holt	Mille	23.4855	2.9706	2.6740	2.7748	2.6720	2.7828	2.7974
Twenty	MilleE	46.0982	0.4957	0.4957	0.4957	0.4957	0.4957	0.4957
Upper Malone	MilleE	54.4403	0.2150	0.2150	0.2150	0.2150	0.2150	0.2150
Thaines	MilleE	46.9483	0.1766	0.1766	0.1766	0.1766	0.1766	0.1766
Cedar Lake	MilleE	19.0531	0.4642	0.4642	0.4642	0.4642	0.4642	0.4642
Cedar Ck	MilleE	47.9956	0.5222	0.5222	0.5222	0.5222	0.5222	0.5222
Seventeen	MilleE	54.6861	0.2649	0.2649	0.2649	0.2649	0.2649	0.2649
Ditch 36	MilleE	54.0004	0.1257	0.1257	0.1257	0.1257	0.1257	0.1257
Malmo	MilleE	51.2058	0.2862	0.2862	0.2862	0.2862	0.2862	0.2862
Peterson	MilleE	55.8152	0.4923	0.4923	0.4923	0.4923	0.4923	0.4923
Groundhouse	MilleE	54.9024	0.3086	0.3086	0.3086	0.3086	0.3086	0.3086
Mille Lacs	Mille	17.2591	0.0876	0.1543	0.1604	0.1169	0.0934	0.0728
Twelve	Rum	21.2934	0.0748	0.0404	0.0404	0.3378	0.0404	0.3323
Ogechie	Rum	18.1798	0.2108	0.2662	0.2910	0.4141	0.2973	0.3492
Shakopee	Rum	18.9548	0.2000	0.2470	0.2697	0.3842	0.2760	0.3244
Onamia	Rum	19.4024	0.2245	0.2725	0.2886	0.4190	0.2725	0.3703
Rum A	Rum	56.5046	1.0962	1.0938	0.8501	0.0027	0.0027	0.0027
Rum B	Rum	21.7661	0.2391	0.2783	0.2856	0.4770	0.2478	0.3949
Rum C	Rum	54.6435	0.1657	0.0962	0.0956	1.2899	0.0944	1.0293
Rum Total	Rum	23.9672	0.2238	0.2539	0.2604	0.5268	0.2265	0.4322
Net Outflow	Net	25.4163	0.2279	0.2288	0.2321	0.4356	0.3202	0.4615

Concentration Increases Relative to Existing Condition

Variable: Total P **Units:** ppb **Precip:** 0.7 m/yr

Road BMPs: No **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	Basin	Exist	NoBld	Alt-2	Alt-2A	Alt-3	Alt-4	Alt-5
Bay	Miss	99.5802	1.7588	1.3440	1.2369	0.9021	3.0433	2.6892
Nokay	Miss	58.9878	0.1249	0.0713	0.0712	0.0745	0.0702	0.0724
Grave	Miss	62.5297	0.9306	0.5386	0.5322	0.5568	2.4618	2.0544
Noname A	Miss	51.9683	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JackPine	Miss	55.7882	1.0000	0.5750	0.5699	0.5936	4.7896	4.2186
Skunk	Miss	58.9221	0.0907	0.0521	0.0521	0.0521	0.0521	0.0521
Noname B	Miss	59.1541	0.0193	0.0107	0.0107	0.1392	0.0107	0.1392
Rock	Miss	74.6917	3.1488	1.8846	1.8716	1.9437	8.7273	7.7983
Platte	Miss	77.5407	1.5554	0.9246	0.9173	0.9530	3.9169	3.5086
Mississippi Total	Miss	72.0430	0.9675	0.6514	0.6203	0.5536	2.1823	1.9398
WhiteFish	Mille	73.0587	4.2443	3.5609	4.7577	4.5145	7.4848	7.0688
BigPine	Mille	117.4692	3.3574	2.2137	2.2059	2.2658	2.1945	2.2599
Round	Mille	138.2957	3.3432	2.0971	2.0800	2.1553	2.0713	2.1364
Scott	Mille	109.2369	9.2594	5.6262	5.5903	5.7581	8.0515	7.5597
Kenney	Mille	111.2202	9.6667	13.0987	13.3617	11.7876	6.8624	6.7258
Miller	Mille	95.3270	9.8966	5.7912	5.7844	5.9823	5.7215	5.8813
Turtle	Mille	82.0436	5.8414	3.3827	3.3685	3.4941	3.3557	3.4504
Partridge	Mille	166.6662	9.2696	5.4784	5.4472	5.6477	5.3926	5.5810
Chrysler	Mille	104.7660	5.4121	3.1432	3.1200	3.2467	3.0885	3.1780
Borden	Mille	96.6278	5.6023	5.8868	5.9371	5.5254	5.3473	5.1925
Smith	Mille	86.2540	16.2116	15.6476	17.0148	15.5712	15.0302	15.0820
Camp	Mille	79.7439	9.2434	7.8794	7.8463	7.9331	8.8530	8.9047
Holt	Mille	82.8787	10.7442	9.7761	10.2122	9.7734	10.0987	10.1468
Twenty	MilleE	65.3938	0.7977	0.7977	0.7977	0.7977	0.7977	0.7977
Upper Malone	MilleE	60.0981	0.2909	0.2909	0.2909	0.2909	0.2909	0.2909
Thaines	MilleE	48.0907	0.1835	0.1835	0.1835	0.1835	0.1835	0.1835
Cedar Lake	MilleE	104.9973	1.9400	1.9400	1.9400	1.9400	1.9400	1.9400
Cedar Ck	MilleE	70.8034	1.0351	1.0351	1.0351	1.0351	1.0351	1.0351
Seventeen	MilleE	60.4306	0.3579	0.3579	0.3579	0.3579	0.3579	0.3579
Ditch 36	MilleE	59.5024	0.1703	0.1703	0.1703	0.1703	0.1703	0.1703
Malmo	MilleE	61.5680	0.4113	0.4113	0.4113	0.4113	0.4113	0.4113
Peterson	MilleE	61.9537	0.6621	0.6621	0.6621	0.6621	0.6621	0.6621
Groundhouse	MilleE	60.7228	0.4166	0.4166	0.4166	0.4166	0.4166	0.4166
Mille Lacs	Mille	18.6913	0.1849	0.2390	0.2508	0.2046	0.1903	0.1694
Twelve	Rum	85.0099	0.2640	0.1426	0.1426	1.1888	0.1426	1.1693
Ogechie	Rum	21.2853	0.4545	0.4866	0.5360	0.8349	0.6247	0.7561
Shakopee	Rum	23.9327	0.4138	0.4323	0.4777	0.7630	0.5655	0.6913
Onamia	Rum	26.4304	0.4492	0.4727	0.5054	0.8296	0.5486	0.7769
Rum A	Rum	62.8804	1.4685	1.4654	1.1394	0.0037	0.0037	0.0037
Rum B	Rum	29.6919	0.4483	0.4570	0.4720	0.8976	0.4703	0.7826
Rum C	Rum	60.3729	0.2240	0.1300	0.1292	1.7397	0.1276	1.3889
Rum Total	Rum	32.4695	0.3984	0.3935	0.4062	0.9534	0.4084	0.8169
Net Outflow	Net	43.3947	0.4942	0.3835	0.3807	0.7507	0.8752	1.0883

Concentration Increases Relative to Existing Condition

Variable: Total P **Units:** ppb **Precip:** 0.7 m/yr

Road BMPs: Yes **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	Basin	Exist	NoBld	Alt-2	Alt-2A	Alt-3	Alt-4	Alt-5
Bay	Miss	15.9539	0.3941	0.2913	0.2672	0.1921	0.5791	0.4984
Nokay	Miss	34.4801	0.0800	0.0457	0.0456	0.0477	0.0450	0.0464
Grave	Miss	38.0274	0.6219	0.3597	0.3554	0.3719	1.5807	1.3069
Noname A	Miss	51.9683	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JackPine	Miss	41.2672	0.7820	0.4495	0.4455	0.4640	2.8192	2.3674
Skunk	Miss	40.4531	0.0668	0.0383	0.0383	0.0384	0.0383	0.0384
Noname B	Miss	53.0557	0.0177	0.0098	0.0098	0.0390	0.0098	0.0390
Rock	Miss	21.2447	1.1056	0.6592	0.6546	0.6800	2.4690	2.1285
Platte	Miss	17.9043	0.2485	0.1461	0.1447	0.1504	0.4267	0.3755
Mississippi Total	Miss	30.9759	0.2317	0.1434	0.1386	0.1340	0.4984	0.4245
WhiteFish	Mille	19.0553	1.3724	1.1490	1.4544	1.3126	2.0565	1.9175
BigPine	Mille	16.2912	0.7152	0.4692	0.4675	0.4803	0.4650	0.4791
Round	Mille	12.8830	0.5206	0.3069	0.3027	0.3170	0.3018	0.3120
Scott	Mille	12.4115	1.6127	0.9641	0.9578	0.9873	1.3947	1.3067
Kenney	Mille	15.6911	2.1254	3.8893	3.9981	3.3576	1.2574	1.2843
Miller	Mille	15.8071	2.3238	1.3381	1.3365	1.3833	1.3217	1.3594
Turtle	Mille	16.6045	1.5459	0.8876	0.8838	0.9172	0.8804	0.9056
Partridge	Mille	11.4376	1.3847	0.7981	0.7934	0.8237	0.7852	0.8136
Chrysler	Mille	11.2944	0.8633	0.4965	0.4928	0.5131	0.4877	0.5021
Borden	Mille	18.9545	1.6910	1.9361	1.9572	1.7771	1.6916	1.6059
Smith	Mille	16.4277	4.2780	4.1204	4.2463	4.0991	3.9486	3.9630
Camp	Mille	23.7301	3.5098	2.9792	2.9664	3.0000	3.0883	3.1085
Holt	Mille	20.3768	2.6535	2.3863	2.4084	2.3823	2.3579	2.3714
Twenty	MilleE	46.0957	0.6068	0.6068	0.6068	0.6068	0.6068	0.6068
Upper Malone	MilleE	60.0981	0.2909	0.2909	0.2909	0.2909	0.2909	0.2909
Thaines	MilleE	46.9981	0.1801	0.1801	0.1801	0.1801	0.1801	0.1801
Cedar Lake	MilleE	16.5332	0.4390	0.4390	0.4390	0.4390	0.4390	0.4390
Cedar Ck	MilleE	53.4272	0.6500	0.6500	0.6500	0.6500	0.6500	0.6500
Seventeen	MilleE	60.4306	0.3579	0.3579	0.3579	0.3579	0.3579	0.3579
Ditch 36	MilleE	59.5024	0.1703	0.1703	0.1703	0.1703	0.1703	0.1703
Malmo	MilleE	54.3105	0.3733	0.3733	0.3733	0.3733	0.3733	0.3733
Peterson	MilleE	61.9537	0.6621	0.6621	0.6621	0.6621	0.6621	0.6621
Groundhouse	MilleE	60.7228	0.4166	0.4166	0.4166	0.4166	0.4166	0.4166
Mille Lacs	Mille	17.2758	0.0491	0.0933	0.0940	0.0659	0.0392	0.0291
Twelve	Rum	18.2558	0.0734	0.0396	0.0396	0.1438	0.0396	0.1383
Ogechie	Rum	18.6174	0.3371	0.3539	0.3863	0.5791	0.4027	0.4978
Shakopee	Rum	19.5055	0.2981	0.3043	0.3318	0.4997	0.3470	0.4300
Onamia	Rum	19.8294	0.3302	0.3438	0.3584	0.5011	0.3309	0.4450
Rum A	Rum	62.8804	1.4685	1.4654	1.1394	0.0037	0.0037	0.0037
Rum B	Rum	23.6654	0.3341	0.3328	0.3306	0.5561	0.2642	0.4368
Rum C	Rum	60.3729	0.2240	0.1300	0.1292	1.2353	0.1276	0.8838
Rum Total	Rum	26.9885	0.2886	0.2737	0.2706	0.5933	0.2146	0.4529
Net Outflow	Net	28.0893	0.2669	0.2299	0.2260	0.4582	0.2905	0.4413

Concentration Increases Relative to Existing Condition

Variable: Total P **Units:** ppb **Precip:** 0.7 m/yr

Road BMPs: Yes **Urban BMP's:** Yes

		Base	Increase Relative to Base--->					
Segment	Basin	Exist	NoBld	Alt-2	Alt-2A	Alt-3	Alt-4	Alt-5
Bay	Miss	15.9539	0.1320	0.1007	0.0927	0.0675	0.2297	0.2026
Nokay	Miss	34.4801	0.0233	0.0133	0.0133	0.0139	0.0131	0.0135
Grave	Miss	38.0274	0.1754	0.1014	0.1002	0.1049	0.4650	0.3878
Noname A	Miss	51.9683	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JackPine	Miss	41.2672	0.2139	0.1229	0.1218	0.1269	1.0282	0.9051
Skunk	Miss	40.4531	0.0184	0.0106	0.0106	0.0106	0.0106	0.0106
Noname B	Miss	53.0557	0.0043	0.0024	0.0024	0.0308	0.0024	0.0308
Rock	Miss	21.2447	0.3572	0.2130	0.2115	0.2197	1.0069	0.8971
Platte	Miss	17.9043	0.0852	0.0501	0.0496	0.0516	0.1810	0.1631
Mississippi Total	Miss	30.9759	0.0435	0.0253	0.0249	0.0292	0.1333	0.1194
WhiteFish	Mille	19.0553	0.4503	0.3770	0.5055	0.4793	0.8021	0.7565
BigPine	Mille	16.2912	0.2391	0.1568	0.1563	0.1606	0.1555	0.1602
Round	Mille	12.8830	0.1819	0.1075	0.1061	0.1111	0.1058	0.1093
Scott	Mille	12.4115	0.5529	0.3306	0.3284	0.3385	0.4782	0.4480
Kenney	Mille	15.6911	0.7032	1.3443	1.3809	1.1658	0.4132	0.4227
Miller	Mille	15.8071	0.7794	0.4488	0.4483	0.4639	0.4433	0.4559
Turtle	Mille	16.6045	0.5157	0.2961	0.2949	0.3060	0.2937	0.3021
Partridge	Mille	11.4376	0.4777	0.2753	0.2737	0.2842	0.2709	0.2807
Chrysler	Mille	11.2944	0.2981	0.1714	0.1701	0.1771	0.1684	0.1733
Borden	Mille	18.9545	0.5437	0.6674	0.6743	0.6153	0.6328	0.6045
Smith	Mille	16.4277	1.4289	1.3762	1.5042	1.3691	1.3189	1.3237
Camp	Mille	23.7301	1.0985	0.9325	0.9284	0.9390	1.0508	1.0571
Holt	Mille	20.3768	0.8478	0.7590	0.7828	0.7580	0.7931	0.7975
Twenty	MilleE	46.0957	0.1549	0.1549	0.1549	0.1549	0.1549	0.1549
Upper Malone	MilleE	60.0981	0.0623	0.0623	0.0623	0.0623	0.0623	0.0623
Thaines	MilleE	46.9981	0.0455	0.0455	0.0455	0.0455	0.0455	0.0455
Cedar Lake	MilleE	16.5332	0.1447	0.1447	0.1447	0.1447	0.1447	0.1447
Cedar Ck	MilleE	53.4272	0.1085	0.1085	0.1085	0.1085	0.1085	0.1085
Seventeen	MilleE	60.4306	0.0762	0.0762	0.0762	0.0762	0.0762	0.0762
Ditch 36	MilleE	59.5024	0.0368	0.0368	0.0368	0.0368	0.0368	0.0368
Malmo	MilleE	54.3105	0.0865	0.0865	0.0865	0.0865	0.0865	0.0865
Peterson	MilleE	61.9537	0.1379	0.1379	0.1379	0.1379	0.1379	0.1379
Groundhouse	MilleE	60.7228	0.0884	0.0884	0.0884	0.0884	0.0884	0.0884
Mille Lacs	Mille	17.2758	-0.0153	0.0052	0.0067	-0.0062	-0.0141	-0.0202
Twelve	Rum	18.2558	0.0239	0.0129	0.0129	0.1080	0.0129	0.1062
Ogechie	Rum	18.6174	0.2429	0.2545	0.2674	0.3618	0.2954	0.3359
Shakopee	Rum	19.5055	0.2049	0.2113	0.2221	0.3044	0.2474	0.2828
Onamia	Rum	19.8294	0.1976	0.2055	0.2119	0.2972	0.2208	0.2828
Rum A	Rum	62.8804	0.3015	0.3009	0.2339	0.0008	0.0008	0.0008
Rum B	Rum	23.6654	0.1581	0.1573	0.1572	0.2769	0.1560	0.2453
Rum C	Rum	60.3729	0.0478	0.0277	0.0276	0.3710	0.0272	0.2962
Rum Total	Rum	26.9885	0.1126	0.1048	0.1036	0.2616	0.1071	0.2258
Net Outflow	Net	28.0893	0.0875	0.0749	0.0736	0.1886	0.1121	0.1928

Concentration Increases Relative to Existing Condition

Variable: Susp. Solids **Units:** ppm **Precip:** 0.7 m/yr

Road BMPs: No **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	Basin	Exist	NoBld	Alt-2	Alt-2A	Alt-3	Alt-4	Alt-5
Bay	Miss	0.1900	0.0054	0.0041	0.0038	0.0028	0.0094	0.0083
Nokay	Miss	1.2111	0.0022	0.0013	0.0013	0.0013	0.0013	0.0013
Grave	Miss	1.3869	0.0186	0.0108	0.0106	0.0111	0.0495	0.0413
Noname A	Miss	23.5883	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JackPine	Miss	2.3080	0.0338	0.0194	0.0192	0.0200	0.1639	0.1441
Skunk	Miss	1.8674	0.0024	0.0014	0.0014	0.0014	0.0014	0.0014
Noname B	Miss	6.2174	0.0016	0.0009	0.0009	0.0116	0.0009	0.0116
Rock	Miss	0.3682	0.0180	0.0107	0.0107	0.0111	0.0512	0.0456
Platte	Miss	0.2535	0.0016	0.0009	0.0009	0.0009	0.0012	0.0012
Mississippi Total	Miss	2.7479	-0.0027	-0.0023	-0.0021	-0.0002	0.0000	0.0010
WhiteFish	Mille	0.3144	0.0216	0.0181	0.0242	0.0230	0.0386	0.0364
BigPine	Mille	0.1784	0.0096	0.0063	0.0063	0.0065	0.0063	0.0064
Round	Mille	0.0925	0.0060	0.0035	0.0034	0.0036	0.0034	0.0035
Scott	Mille	0.1182	0.0209	0.0125	0.0124	0.0128	0.0181	0.0169
Kenney	Mille	0.1788	0.0299	0.0603	0.0620	0.0520	0.0170	0.0175
Miller	Mille	0.1924	0.0324	0.0186	0.0186	0.0192	0.0183	0.0189
Turtle	Mille	0.2305	0.0225	0.0129	0.0128	0.0133	0.0128	0.0131
Partridge	Mille	0.0813	0.0171	0.0098	0.0098	0.0101	0.0097	0.0100
Chrysler	Mille	0.1023	0.0111	0.0064	0.0063	0.0066	0.0062	0.0064
Borden	Mille	0.3123	0.0281	0.0345	0.0349	0.0318	0.0336	0.0320
Smith	Mille	0.2188	0.0618	0.0595	0.0651	0.0592	0.0570	0.0572
Camp	Mille	0.3868	0.0596	0.0505	0.0503	0.0509	0.0570	0.0573
Holt	Mille	0.2424	0.0086	0.0087	0.0089	0.0083	0.0071	0.0071
Twenty	MilleE	2.0058	0.0241	0.0241	0.0241	0.0241	0.0241	0.0241
Upper Malone	MilleE	23.7243	0.0795	0.0795	0.0795	0.0795	0.0795	0.0795
Thaines	MilleE	5.6064	0.0373	0.0373	0.0373	0.0373	0.0373	0.0373
Cedar Lake	MilleE	0.1817	0.0061	0.0061	0.0061	0.0061	0.0061	0.0061
Cedar Ck	MilleE	19.6153	0.1434	0.1434	0.1434	0.1434	0.1434	0.1434
Seventeen	MilleE	23.8151	0.0978	0.0978	0.0978	0.0978	0.0978	0.0978
Ditch 36	MilleE	23.5616	0.0465	0.0465	0.0465	0.0465	0.0465	0.0465
Malmo	MilleE	5.2327	0.0314	0.0314	0.0314	0.0314	0.0314	0.0314
Peterson	MilleE	24.2312	0.1808	0.1808	0.1808	0.1808	0.1808	0.1808
Groundhouse	MilleE	23.8949	0.1138	0.1138	0.1138	0.1138	0.1138	0.1138
Mille Lacs	Mille	0.0655	0.0008	0.0017	0.0018	0.0012	0.0008	0.0005
Twelve	Rum	0.2414	0.0011	0.0006	0.0006	0.0049	0.0006	0.0048
Ogechie	Rum	0.4658	0.0064	0.0047	0.0098	0.0530	0.0279	0.0466
Shakopee	Rum	0.4613	0.0034	0.0022	0.0036	0.0151	0.0084	0.0134
Onamia	Rum	0.3464	0.0076	0.0081	0.0077	0.0142	0.0053	0.0149
Rum A	Rum	24.4843	0.4011	0.4003	0.3112	0.0010	0.0010	0.0010
Rum B	Rum	2.4743	0.0174	0.0122	0.0066	0.0544	-0.0073	0.0345
Rum C	Rum	23.7994	0.0612	0.0355	0.0353	0.4752	0.0349	0.3794
Rum Total	Rum	4.4072	0.0104	0.0002	-0.0056	0.0883	-0.0156	0.0614
Net Outflow	Net	3.9487	0.0076	0.0012	-0.0028	0.0662	-0.0120	0.0446

Concentration Increases Relative to Existing Condition

Variable: Susp. Solids **Units:** ppm **Precip:** 0.87 m/yr

Road BMPs: No **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	Basin	Exist	NoBld	Alt-2	Alt-2A	Alt-3	Alt-4	Alt-5
Bay	Miss	0.2345	0.0067	0.0051	0.0047	0.0034	0.0116	0.0103
Nokay	Miss	1.4497	0.0027	0.0015	0.0015	0.0016	0.0015	0.0016
Grave	Miss	1.6554	0.0222	0.0128	0.0127	0.0133	0.0591	0.0492
Noname A	Miss	16.9360	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JackPine	Miss	2.6761	0.0391	0.0225	0.0223	0.0232	0.1899	0.1669
Skunk	Miss	2.1965	0.0029	0.0017	0.0017	0.0017	0.0017	0.0017
Noname B	Miss	6.5619	0.0017	0.0009	0.0009	0.0123	0.0009	0.0123
Rock	Miss	0.4520	0.0221	0.0132	0.0131	0.0136	0.0628	0.0559
Platte	Miss	0.3130	0.0021	0.0012	0.0012	0.0012	0.0019	0.0019
Mississippi Total	Miss	2.4074	0.0030	0.0015	0.0016	0.0030	0.0127	0.0121
WhiteFish	Mille	0.3863	0.0265	0.0222	0.0298	0.0282	0.0474	0.0447
BigPine	Mille	0.2204	0.0119	0.0078	0.0078	0.0080	0.0077	0.0080
Round	Mille	0.1151	0.0075	0.0043	0.0042	0.0045	0.0042	0.0044
Scott	Mille	0.1462	0.0259	0.0154	0.0153	0.0158	0.0223	0.0209
Kenney	Mille	0.2204	0.0369	0.0740	0.0761	0.0639	0.0210	0.0216
Miller	Mille	0.2375	0.0399	0.0229	0.0229	0.0237	0.0226	0.0233
Turtle	Mille	0.2840	0.0277	0.0159	0.0158	0.0164	0.0157	0.0162
Partridge	Mille	0.1007	0.0211	0.0122	0.0121	0.0125	0.0120	0.0124
Chrysler	Mille	0.1265	0.0137	0.0079	0.0078	0.0081	0.0077	0.0079
Borden	Mille	0.3821	0.0343	0.0422	0.0427	0.0390	0.0411	0.0391
Smith	Mille	0.2697	0.0762	0.0733	0.0802	0.0729	0.0702	0.0705
Camp	Mille	0.4745	0.0731	0.0619	0.0617	0.0624	0.0699	0.0703
Holt	Mille	0.3058	0.0151	0.0146	0.0151	0.0142	0.0131	0.0132
Twenty	MilleE	2.3488	0.0282	0.0282	0.0282	0.0282	0.0282	0.0282
Upper Malone	MilleE	17.0457	0.0642	0.0642	0.0642	0.0642	0.0642	0.0642
Thaines	MilleE	5.9497	0.0397	0.0397	0.0397	0.0397	0.0397	0.0397
Cedar Lake	MilleE	0.2243	0.0075	0.0075	0.0075	0.0075	0.0075	0.0075
Cedar Ck	MilleE	13.7420	0.1233	0.1233	0.1233	0.1233	0.1233	0.1233
Seventeen	MilleE	17.1190	0.0790	0.0790	0.0790	0.0790	0.0790	0.0790
Ditch 36	MilleE	16.9145	0.0375	0.0375	0.0375	0.0375	0.0375	0.0375
Malmo	MilleE	5.6007	0.0337	0.0337	0.0337	0.0337	0.0337	0.0337
Peterson	MilleE	17.4559	0.1469	0.1469	0.1469	0.1469	0.1469	0.1469
Groundhouse	MilleE	17.1835	0.0921	0.0921	0.0921	0.0921	0.0921	0.0921
Mille Lacs	Mille	0.0825	0.0010	0.0022	0.0022	0.0015	0.0010	0.0007
Twelve	Rum	0.2972	0.0013	0.0007	0.0007	0.0061	0.0007	0.0060
Ogechie	Rum	0.3893	0.0056	0.0048	0.0087	0.0418	0.0222	0.0364
Shakopee	Rum	0.4808	0.0040	0.0029	0.0048	0.0204	0.0112	0.0179
Onamia	Rum	0.4250	0.0079	0.0081	0.0082	0.0184	0.0077	0.0183
Rum A	Rum	17.6615	0.3270	0.3263	0.2536	0.0008	0.0008	0.0008
Rum B	Rum	1.5157	0.0171	0.0153	0.0128	0.0443	0.0053	0.0328
Rum C	Rum	17.1063	0.0494	0.0287	0.0285	0.3848	0.0282	0.3071
Rum Total	Rum	2.5600	0.0166	0.0126	0.0101	0.0673	0.0038	0.0511
Net Outflow	Net	2.5249	0.0135	0.0101	0.0082	0.0526	0.0058	0.0421

Concentration Increases Relative to Existing Condition

Variable: Road Salt **Units:** ppm **Precip:** 0.7 m/yr

Road BMPs: No **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	Basin	Exist	NoBld	Alt-2	Alt-2A	Alt-3	Alt-4	Alt-5
Bay	Miss	3.4665	-0.0284	0.5862	0.5882	0.5945	5.2782	5.2928
Nokay	Miss	2.4852	-0.0012	-0.0007	-0.0007	-0.0007	-0.0007	-0.0007
Grave	Miss	24.6852	-0.0912	-0.0528	-0.0521	-0.0545	0.5381	0.5793
Noname A	Miss	1.3720	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JackPine	Miss	14.6452	-0.0566	-0.0325	-0.0323	-0.0336	8.5118	8.5638
Skunk	Miss	7.0656	-0.0025	-0.0014	-0.0014	-0.0014	-0.0014	-0.0014
Noname B	Miss	9.7065	-0.0007	-0.0004	-0.0004	0.6847	-0.0004	0.6847
Rock	Miss	22.9500	-0.3013	-0.1803	-0.1791	-0.1860	16.7893	16.9490
Platte	Miss	11.2521	-0.0738	-0.0439	-0.0435	-0.0452	7.5907	7.6237
Mississippi Total	Miss	8.3913	-0.0335	0.1216	0.1227	0.1905	3.4970	3.5740
WhiteFish	Mille	10.2953	-0.1809	-0.1518	2.6696	3.5207	12.4762	12.5167
BigPine	Mille	2.4026	-0.0409	-0.0270	-0.0269	-0.0276	-0.0268	-0.0276
Round	Mille	1.5951	-0.0303	-0.0190	-0.0188	-0.0195	-0.0187	-0.0193
Scott	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Kenney	Mille	5.9209	-0.2815	5.1580	5.1427	5.2344	-0.1998	-0.1959
Miller	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Turtle	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Partridge	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Chrysler	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Borden	Mille	5.8890	-0.1514	3.5141	3.5119	3.5301	5.8959	5.9044
Smith	Mille	15.1301	-1.0744	-1.0370	10.0366	-1.0320	-0.9961	-0.9996
Camp	Mille	13.9739	-0.5544	-0.4726	-0.4706	-0.4758	5.2449	5.2405
Holt	Mille	13.1150	-0.6107	-0.5556	2.9714	-0.5554	2.8994	2.8959
Twenty	MilleE	4.2505	-0.0137	-0.0137	-0.0137	-0.0137	-0.0137	-0.0137
Upper Malone	MilleE	1.5142	-0.0017	-0.0017	-0.0017	-0.0017	-0.0017	-0.0017
Thaines	MilleE	0.9114	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006
Cedar Lake	MilleE	12.3831	-0.1156	-0.1156	-0.1156	-0.1156	-0.1156	-0.1156
Cedar Ck	MilleE	5.6444	-0.0241	-0.0241	-0.0241	-0.0241	-0.0241	-0.0241
Seventeen	MilleE	1.8660	-0.0026	-0.0026	-0.0026	-0.0026	-0.0026	-0.0026
Ditch 36	MilleE	0.8841	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006
Malmo	MilleE	2.1545	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035	-0.0035
Peterson	MilleE	3.4772	-0.0092	-0.0092	-0.0092	-0.0092	-0.0092	-0.0092
Groundhouse	MilleE	2.1751	-0.0036	-0.0036	-0.0036	-0.0036	-0.0036	-0.0036
Mille Lacs	Mille	6.6873	-0.0537	1.9495	2.5051	1.1728	2.1346	1.2435
Twelve	Rum	6.0947	-0.0071	-0.0038	-0.0038	6.0311	-0.0038	6.0321
Ogechie	Rum	7.0940	-0.0556	1.9278	2.5046	2.0013	2.8208	2.1475
Shakopee	Rum	7.2701	-0.0546	1.8280	2.3756	1.8978	2.6758	2.0366
Onamia	Rum	8.1032	-0.0609	1.8426	2.3604	2.3246	2.6607	2.4636
Rum A	Rum	6.8773	-0.0404	-0.0403	-0.0314	-0.0001	-0.0001	-0.0001
Rum B	Rum	7.7498	-0.0553	1.6840	2.1576	2.4512	2.4327	2.5804
Rum C	Rum	5.2837	-0.0047	-0.0027	-0.0027	3.6190	-0.0027	3.6314
Rum Total	Rum	7.5262	-0.0495	1.5338	1.9650	2.5573	2.2147	2.6760
Net Outflow	Net	7.7653	-0.0455	1.1442	1.4570	1.9054	2.5700	2.9242

Concentration Increases Relative to Existing Condition

Variable: Road Salt **Units:** ppm **Precip:** 0.87 m/yr

Road BMPs: No **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	Basin	Exist	NoBld	Alt-2	Alt-2A	Alt-3	Alt-4	Alt-5
Bay	Miss	1.7480	-0.0080	0.3012	0.3018	0.3036	2.6892	2.6934
Nokay	Miss	1.4089	-0.0004	-0.0002	-0.0002	-0.0003	-0.0002	-0.0003
Grave	Miss	14.0988	-0.0330	-0.0191	-0.0189	-0.0197	0.3591	0.3741
Noname A	Miss	0.7926	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
JackPine	Miss	8.3855	-0.0206	-0.0118	-0.0117	-0.0122	4.9638	4.9830
Skunk	Miss	4.0459	-0.0009	-0.0005	-0.0005	-0.0005	-0.0005	-0.0005
Noname B	Miss	5.6367	-0.0003	-0.0002	-0.0002	0.3988	-0.0002	0.3988
Rock	Miss	12.3897	-0.0979	-0.0585	-0.0581	-0.0603	9.3817	9.4348
Platte	Miss	5.9591	-0.0230	-0.0137	-0.0136	-0.0141	4.0886	4.0990
Mississippi Total	Miss	4.5831	-0.0111	0.0714	0.0717	0.1083	1.9331	1.9727
WhiteFish	Mille	5.4810	-0.0573	-0.0480	1.4774	1.9311	6.7979	6.8110
BigPine	Mille	1.1964	-0.0113	-0.0075	-0.0074	-0.0076	-0.0074	-0.0076
Round	Mille	0.7495	-0.0075	-0.0047	-0.0046	-0.0048	-0.0046	-0.0048
Scott	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Kenney	Mille	2.8626	-0.0746	2.6587	2.6545	2.6797	-0.0526	-0.0516
Miller	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Turtle	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Partridge	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Chrysler	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Borden	Mille	2.9990	-0.0440	1.8465	1.8459	1.8512	3.0673	3.0698
Smith	Mille	7.7761	-0.3247	-0.3130	5.5866	-0.3115	-0.3003	-0.3014
Camp	Mille	7.5655	-0.1831	-0.1557	-0.1551	-0.1568	3.0000	2.9985
Holt	Mille	6.9585	-0.1944	-0.1765	1.7349	-0.1765	1.6942	1.6931
Twenty	MilleE	2.4342	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050	-0.0050
Upper Malone	MilleE	0.8754	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006
Thaines	MilleE	0.7136	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004
Cedar Lake	MilleE	6.2080	-0.0324	-0.0324	-0.0324	-0.0324	-0.0324	-0.0324
Cedar Ck	MilleE	3.1760	-0.0085	-0.0085	-0.0085	-0.0085	-0.0085	-0.0085
Seventeen	MilleE	1.0792	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010
Ditch 36	MilleE	0.5106	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002
Malmo	MilleE	1.2414	-0.0013	-0.0013	-0.0013	-0.0013	-0.0013	-0.0013
Peterson	MilleE	2.0155	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034	-0.0034
Groundhouse	MilleE	1.2585	-0.0013	-0.0013	-0.0013	-0.0013	-0.0013	-0.0013
Mille Lacs	Mille	2.6098	-0.0091	0.7799	0.9987	0.4729	0.8492	0.4985
Twelve	Rum	3.1661	-0.0021	-0.0011	-0.0011	3.1470	-0.0011	3.1473
Ogechie	Rum	2.8099	-0.0097	0.7828	1.0137	0.8125	1.1363	0.8679
Shakopee	Rum	2.9207	-0.0098	0.7529	0.9751	0.7815	1.0932	0.8349
Onamia	Rum	3.2865	-0.0112	0.7676	0.9797	0.9648	1.0984	1.0187
Rum A	Rum	3.9915	-0.0151	-0.0151	-0.0117	0.0000	0.0000	0.0000
Rum B	Rum	3.2282	-0.0107	0.7196	0.9186	1.0423	1.0302	1.0933
Rum C	Rum	3.0557	-0.0017	-0.0010	-0.0010	2.1057	-0.0010	2.1103
Rum Total	Rum	3.2166	-0.0101	0.6716	0.8573	1.1135	0.9613	1.1614
Net Outflow	Net	3.5310	-0.0105	0.5332	0.6763	0.8821	1.1858	1.3485

Concentration Increases Relative to Existing Condition

Variable: Traffic **Units:** rel **Precip:** 0.7 m/yr

Road BMPs: No **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	Basin	Exist	NoBld	Alt-2	Alt-2A	Alt-3	Alt-4	Alt-5
Bay	Miss	2.0417	2.6356	4.2380	4.2381	4.3010	4.9152	6.8215
Nokay	Miss	6.6256	12.1966	16.4203	16.4203	16.6172	7.2379	18.2644
Grave	Miss	27.0269	143.4952	71.6001	71.6003	69.9976	164.8012	78.7731
Noname A	Miss	3.5223	79.2506	12.3279	12.3279	10.5668	105.6675	7.0445
JackPine	Miss	7.8552	98.5712	21.8584	21.8585	16.0585	209.0602	205.5496
Skunk	Miss	6.3983	42.2261	1.2794	1.2794	1.2794	11.5164	1.2794
Noname B	Miss	39.4693	184.2601	55.2304	55.2304	139.0700	20.8062	81.5977
Rock	Miss	5.3645	24.4623	3.7854	3.7855	2.8685	49.7160	35.5200
Platte	Miss	0.3849	2.3779	0.1196	0.1196	0.1055	1.3377	0.6256
Mississippi Total	Miss	8.9704	48.7589	16.8879	16.8903	24.2326	40.8108	33.8530
WhiteFish	Mille	2.5738	3.4090	4.6153	17.4078	25.7378	29.2303	25.1774
BigPine	Mille	1.6927	2.5750	2.4649	2.4649	2.4281	2.3913	2.5385
Round	Mille	0.0183	0.0287	0.0272	0.0272	0.0268	0.0264	0.0280
Scott	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Kenney	Mille	11.1064	9.8481	14.7673	14.7664	14.9477	1.2241	0.1673
Miller	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Turtle	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Partridge	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Chrysler	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Borden	Mille	11.0666	12.2805	15.0375	15.0373	15.0555	19.9587	14.9587
Smith	Mille	1.0102	1.6801	2.0166	38.8817	1.0077	1.6804	2.3531
Camp	Mille	3.3091	16.9931	6.3055	6.3056	4.7750	26.8869	28.5168
Holt	Mille	0.4095	1.9920	0.8239	2.9792	0.5971	3.0813	3.3010
Twenty	MilleE	7.4102	1.7600	1.7600	1.7600	1.7600	1.7600	1.7600
Upper Malone	MilleE	17.3755	4.1126	4.1126	4.1126	4.1126	4.1126	4.1126
Thaines	MilleE	7.9840	1.8959	1.8959	1.8959	1.8959	1.8959	1.8959
Cedar Lake	MilleE	1.9642	0.4674	0.4674	0.4674	0.4674	0.4674	0.4674
Cedar Ck	MilleE	37.2447	8.6758	8.6758	8.6758	8.6758	8.6758	8.6758
Seventeen	MilleE	21.4121	5.0610	5.0610	5.0610	5.0610	5.0610	5.0610
Ditch 36	MilleE	10.1446	2.4072	2.4072	2.4072	2.4072	2.4072	2.4072
Malmo	MilleE	8.8875	2.1098	2.1098	2.1098	2.1098	2.1098	2.1098
Peterson	MilleE	39.9012	9.3708	9.3708	9.3708	9.3708	9.3708	9.3708
Groundhouse	MilleE	24.9594	5.8922	5.8922	5.8922	5.8922	5.8922	5.8922
Mille Lacs	Mille	3.0673	3.8599	4.9142	4.4884	2.5535	3.4887	2.0254
Twelve	Rum	0.7076	0.5503	0.5503	0.5503	26.6486	1.4937	16.2722
Ogechie	Rum	9.8165	11.3739	13.8223	16.6378	80.5645	58.4329	58.0656
Shakopee	Rum	5.1076	9.0868	5.0078	6.1802	34.2248	23.5151	36.2681
Onamia	Rum	19.5414	33.1138	22.4919	22.4087	43.5374	32.9072	43.2100
Rum A	Rum	397.2496	638.3045	638.3174	639.6768	13.2356	644.4118	132.4087
Rum B	Rum	38.2079	62.9087	53.1397	53.0484	78.0443	62.7222	70.0696
Rum C	Rum	86.9862	148.7359	-13.1260	-13.1258	827.9356	66.8084	496.3166
Rum Total	Rum	42.6293	70.6189	47.1448	47.0622	145.8618	63.0627	108.6106
Net Outflow	Net	33.3285	64.6073	38.8501	38.7966	112.4627	56.8884	87.9468

Concentration Increases Relative to Existing Condition

Variable: Traffic **Units:** rel **Precip:** 0.87 m/yr

Road BMPs: No **Urban BMP's:** No

		Base	Increase Relative to Base--->					
Segment	Basin	Exist	NoBld	Alt-2	Alt-2A	Alt-3	Alt-4	Alt-5
Bay	Miss	2.0138	2.5995	4.1800	4.1801	4.2421	4.8478	6.7280
Nokay	Miss	6.1754	11.3677	15.3044	15.3044	15.4879	6.7460	17.0232
Grave	Miss	25.0646	133.0750	66.4010	66.4012	64.9149	152.8306	73.0514
Noname A	Miss	2.0348	45.7821	7.1217	7.1217	6.1043	61.0428	4.0695
JackPine	Miss	6.9444	87.1434	19.3242	19.3243	14.1967	184.8327	181.7275
Skunk	Miss	5.7887	38.2031	1.1575	1.1575	1.1575	10.4192	1.1575
Noname B	Miss	30.7132	143.3835	42.9780	42.9780	108.2220	16.1906	63.4984
Rock	Miss	5.2353	23.8723	3.6941	3.6941	2.7993	48.5140	34.6615
Platte	Miss	0.4375	2.5993	0.1614	0.1614	0.1367	1.8956	1.0341
Mississippi Total	Miss	7.3811	38.8102	14.0775	14.0786	19.4125	33.4564	28.4672
WhiteFish	Mille	2.5168	3.3333	4.5129	17.0214	25.1667	28.5808	24.6181
BigPine	Mille	1.6726	2.5443	2.4356	2.4356	2.3992	2.3629	2.5083
Round	Mille	0.0357	0.0552	0.0526	0.0526	0.0518	0.0510	0.0541
Scott	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Kenney	Mille	10.8379	9.6080	14.4068	14.4059	14.5832	1.1937	0.1626
Miller	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Turtle	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Partridge	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Chrysler	Mille	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Borden	Mille	10.6900	11.8556	14.5235	14.5233	14.5413	19.2331	14.4132
Smith	Mille	0.9939	1.6527	1.9837	38.2494	0.9912	1.6530	2.3147
Camp	Mille	3.2250	16.5591	6.1444	6.1445	4.6529	26.2005	27.7888
Holt	Mille	0.6428	3.0479	1.2638	4.7168	0.9113	4.7206	5.0598
Twenty	MilleE	6.6557	1.5808	1.5808	1.5808	1.5808	1.5808	1.5808
Upper Malone	MilleE	10.0447	2.3826	2.3826	2.3826	2.3826	2.3826	2.3826
Thaines	MilleE	6.5895	1.5651	1.5651	1.5651	1.5651	1.5651	1.5651
Cedar Lake	MilleE	1.9376	0.4610	0.4610	0.4610	0.4610	0.4610	0.4610
Cedar Ck	MilleE	21.1669	4.9728	4.9728	4.9728	4.9728	4.9728	4.9728
Seventeen	MilleE	12.3841	2.9349	2.9349	2.9349	2.9349	2.9349	2.9349
Ditch 36	MilleE	5.8596	1.3921	1.3921	1.3921	1.3921	1.3921	1.3921
Malmo	MilleE	7.0288	1.6692	1.6692	1.6692	1.6692	1.6692	1.6692
Peterson	MilleE	23.1277	5.4585	5.4585	5.4585	5.4585	5.4585	5.4585
Groundhouse	MilleE	14.4417	3.4199	3.4199	3.4199	3.4199	3.4199	3.4199
Mille Lacs	Mille	3.0373	3.8188	4.8597	4.4458	2.5376	3.4668	2.0193
Twelve	Rum	0.6946	0.5403	0.5403	0.5403	26.1620	1.4664	15.9750
Ogechie	Rum	6.6021	7.7981	9.5766	10.8960	44.1868	32.7555	31.9231
Shakopee	Rum	4.8157	7.5871	5.6157	6.4525	28.4537	20.2957	27.6092
Onamia	Rum	14.0948	23.4620	16.4948	16.6582	36.4728	27.4135	35.2732
Rum A	Rum	230.5596	371.7267	371.7316	372.2413	7.6831	374.0132	76.8503
Rum B	Rum	21.6995	35.6905	29.1448	29.2954	50.2655	39.3981	45.9129
Rum C	Rum	50.3060	86.0606	-7.5832	-7.5831	480.1245	38.6529	287.6978
Rum Total	Rum	23.6157	39.0510	26.6864	26.8270	79.0644	39.3429	62.1068
Net Outflow	Net	19.8809	38.9977	23.7964	23.9062	65.3806	37.9797	54.3573

Appendix D

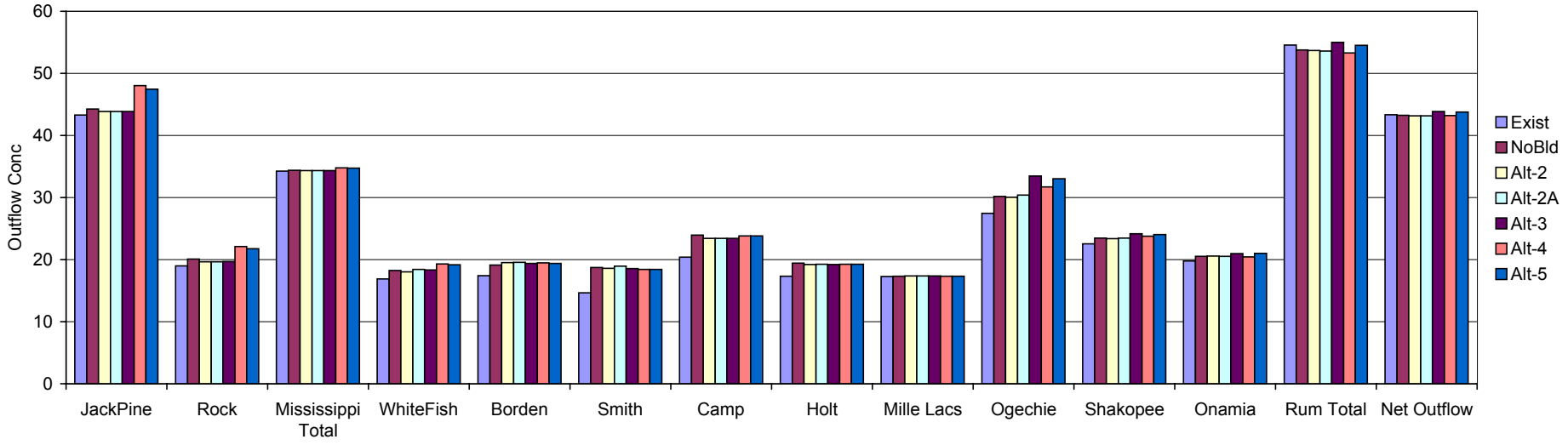
Plots of Concentration Increases Relative to Existing Conditions

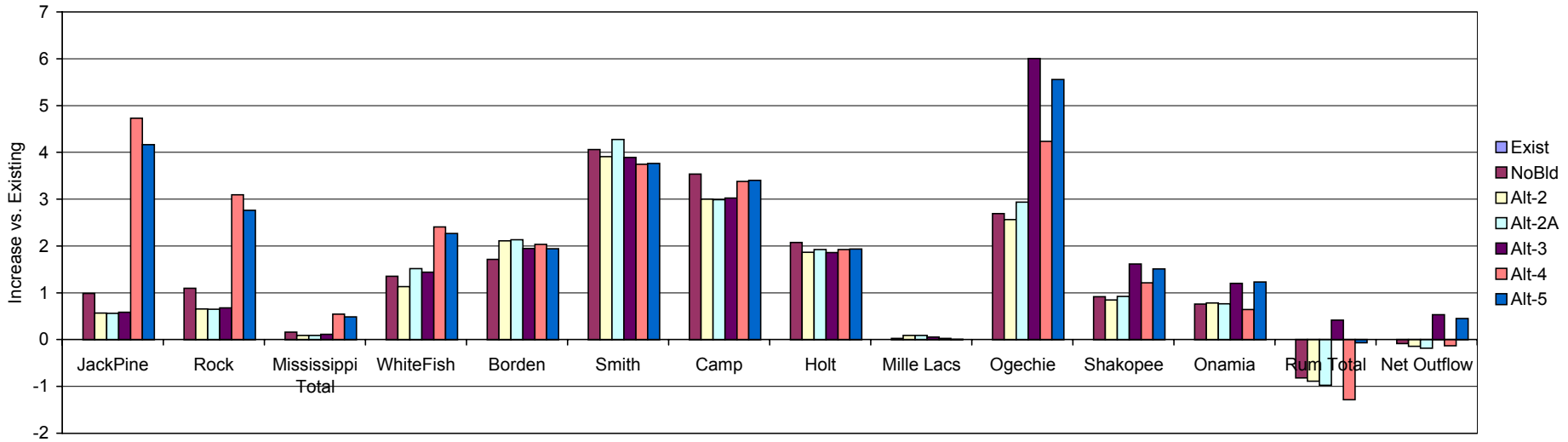
Page/Case	Variable	Hydrology	Assumptions
1	Total P	2000 Calibration	
2	Total P	Average Year	
3	Total P	Wet Year	
4	Total P	Average Year	No P Retention in Upstream Lakes
5	Total P	Average Year	BMP's on New Roads
6	Total P	Average Year	BMP's on New Roads & New Urban Areas
7	TSS	Average Year	
8	TSS	Wet Year	
9	Road Salt	Average Year	
10	Road Salt	Wet Year	
11	Traffic Contam.	Average Year	
12	Traffic Contam.	Wet Year	

Note: Page Numbers Correspond to Cases Identified in Tables 9 & 10

Impacts on Selected Watershed Segments D-1

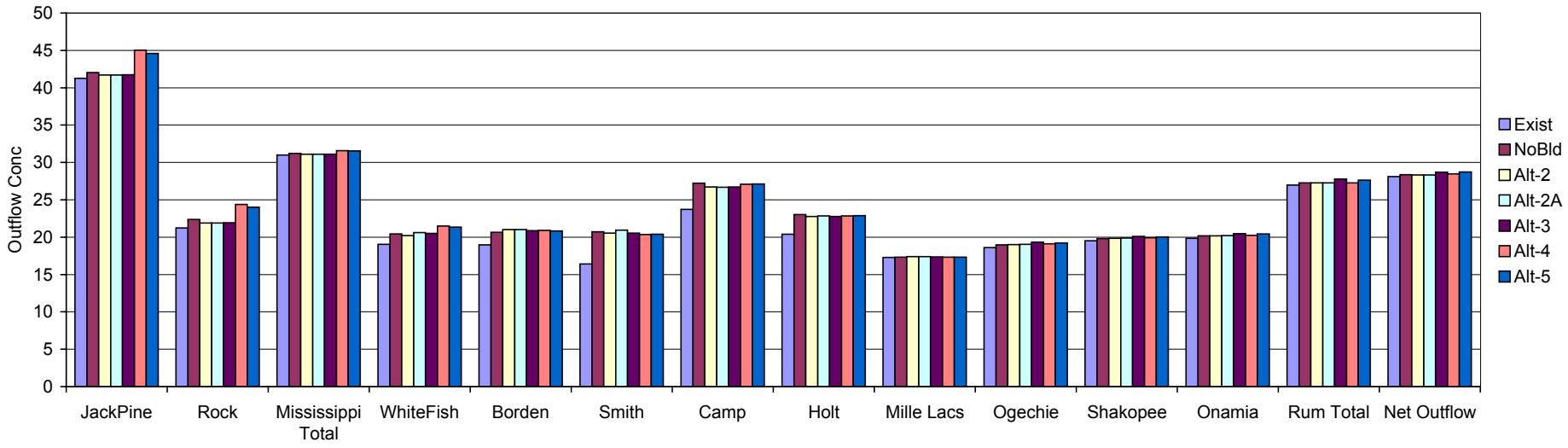
Variable: Total P Units: ppb Precip: 0.58 m/yr Road BMPs: No Urban BMP's: No

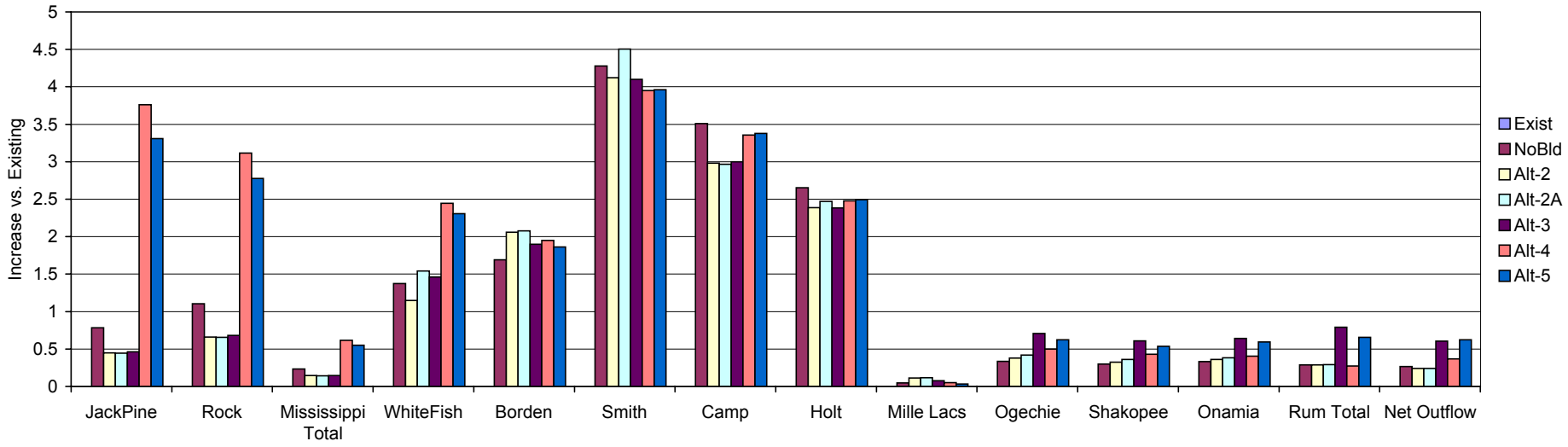




Impacts on Selected Watershed Segments D-2

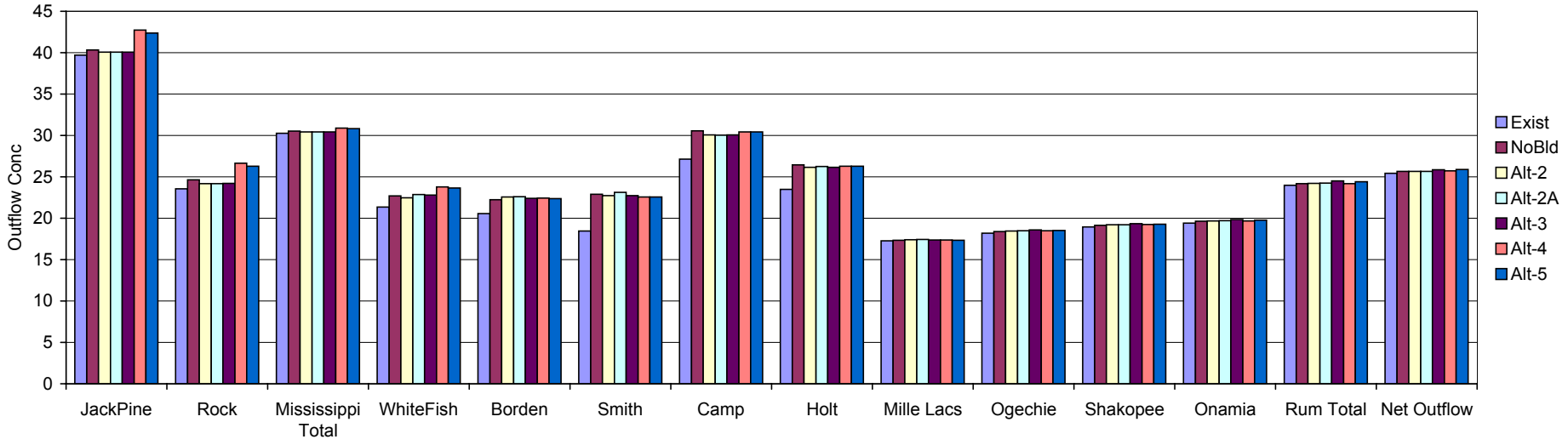
Variable: Total P **Units: ppb** **Precip: 0.7 m/yr** **Road BMPs: No** **Urban BMP's: No**

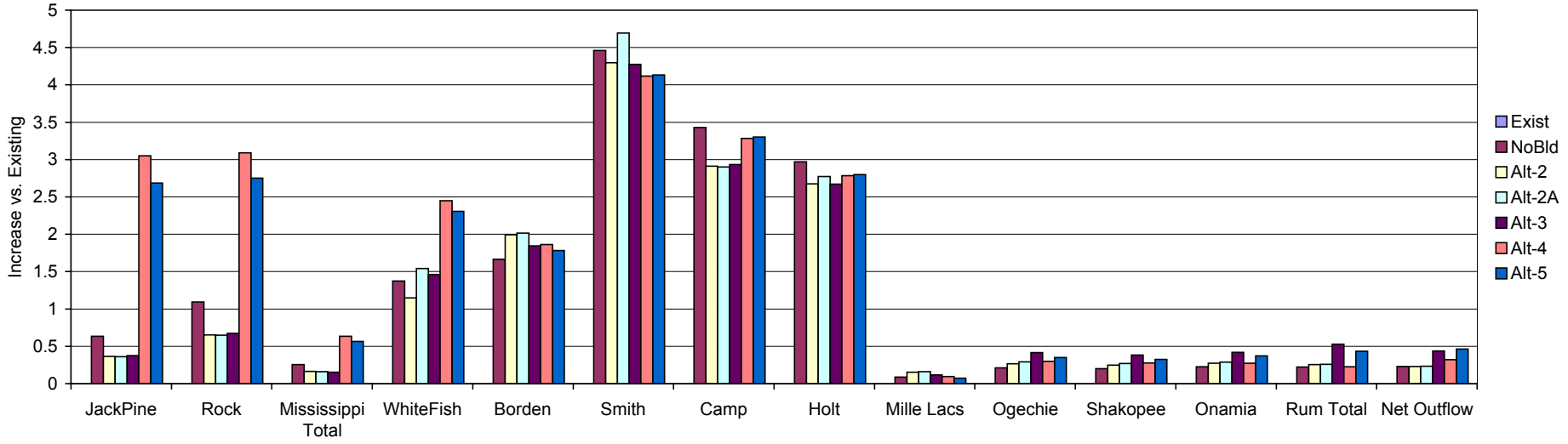




Impacts on Selected Watershed Segments D-3

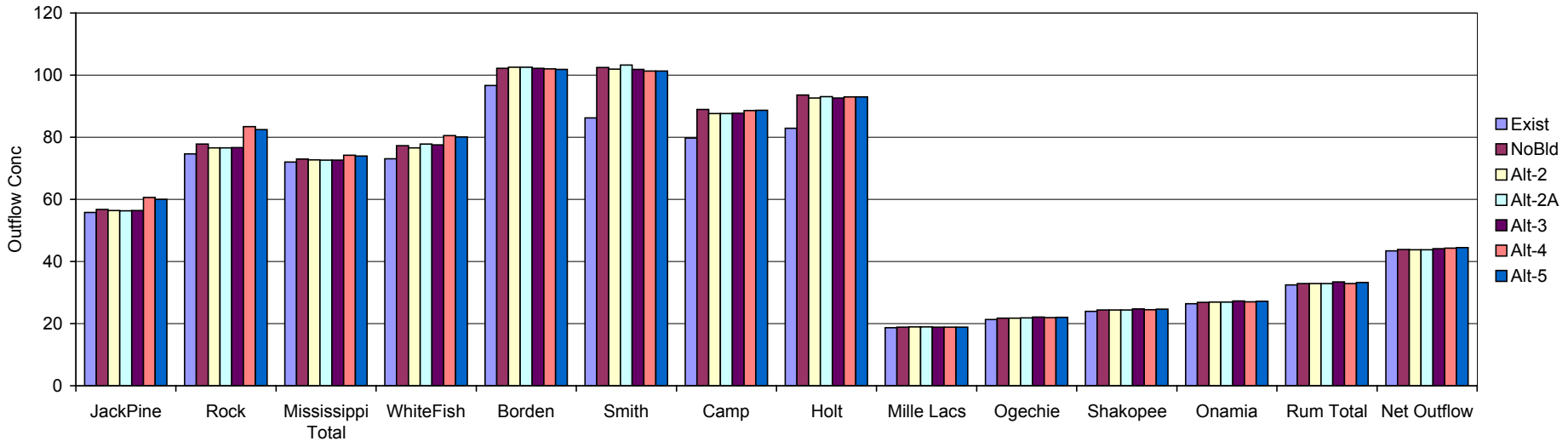
Variable: Total P **Units: ppb** **Precip: 0.87 m/yr** **Road BMPs: No** **Urban BMP's: No**

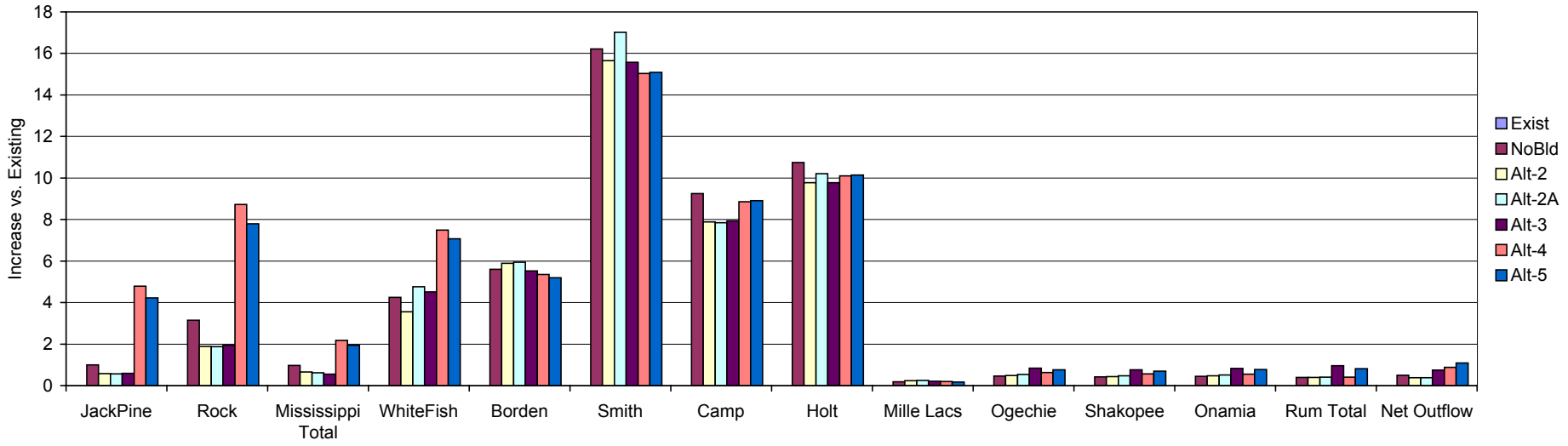




Impacts on Selected Watershed Segments

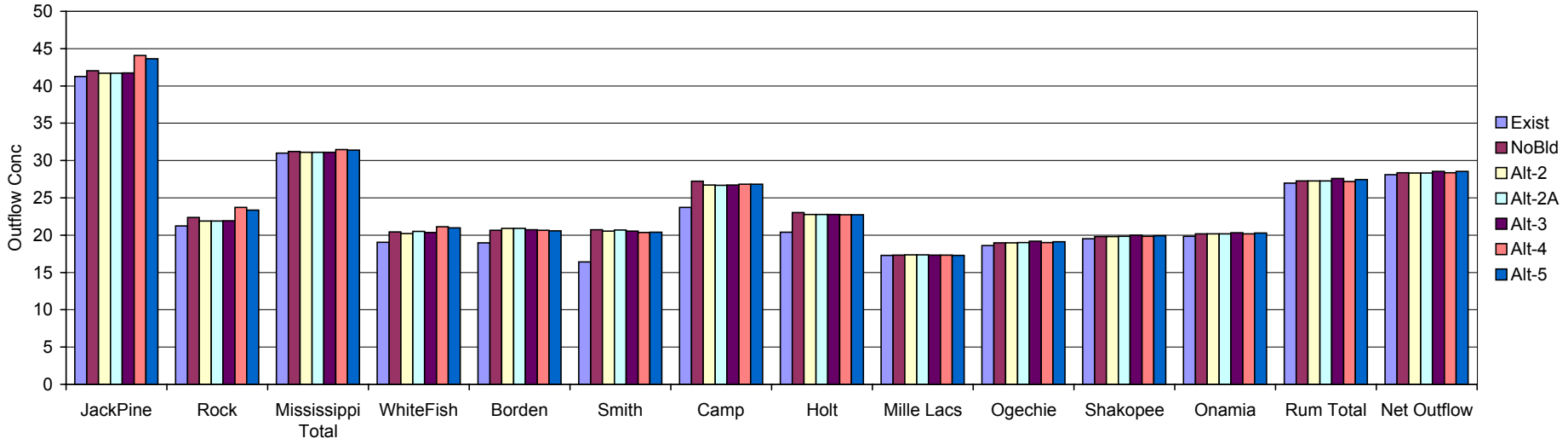
Variable: Total P **Units: ppb** **Precip: 0.7 m/yr** **Road BMPs: No** **Urban BMP's: No**

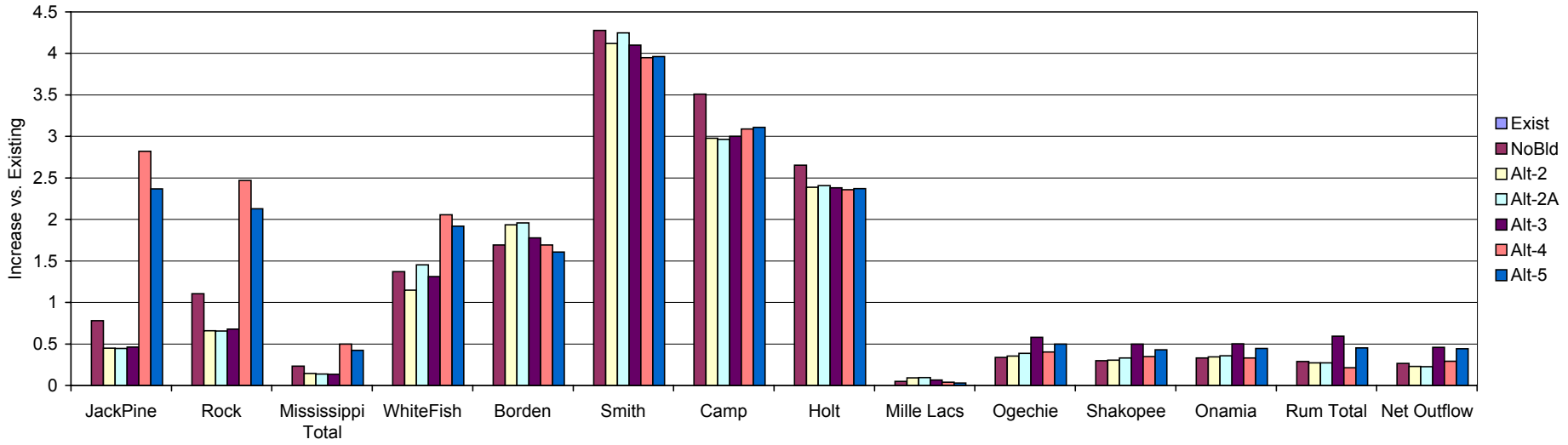




Impacts on Selected Watershed Segments

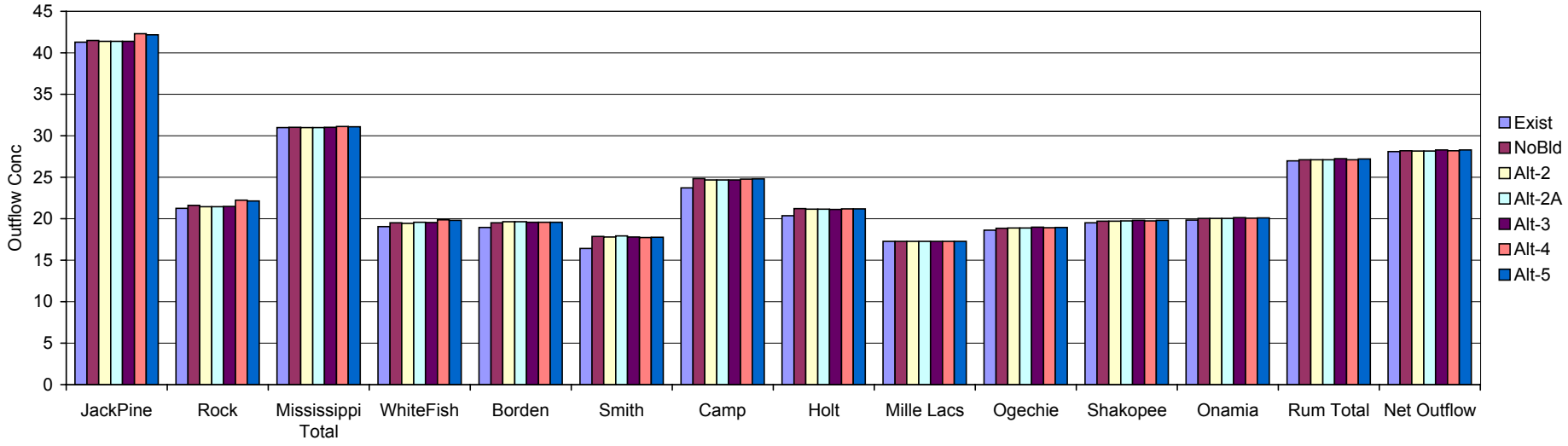
Variable: Total P **Units: ppb** **Precip: 0.7 m/yr** **Road BMPs: Yes** **Urban BMP's: No**

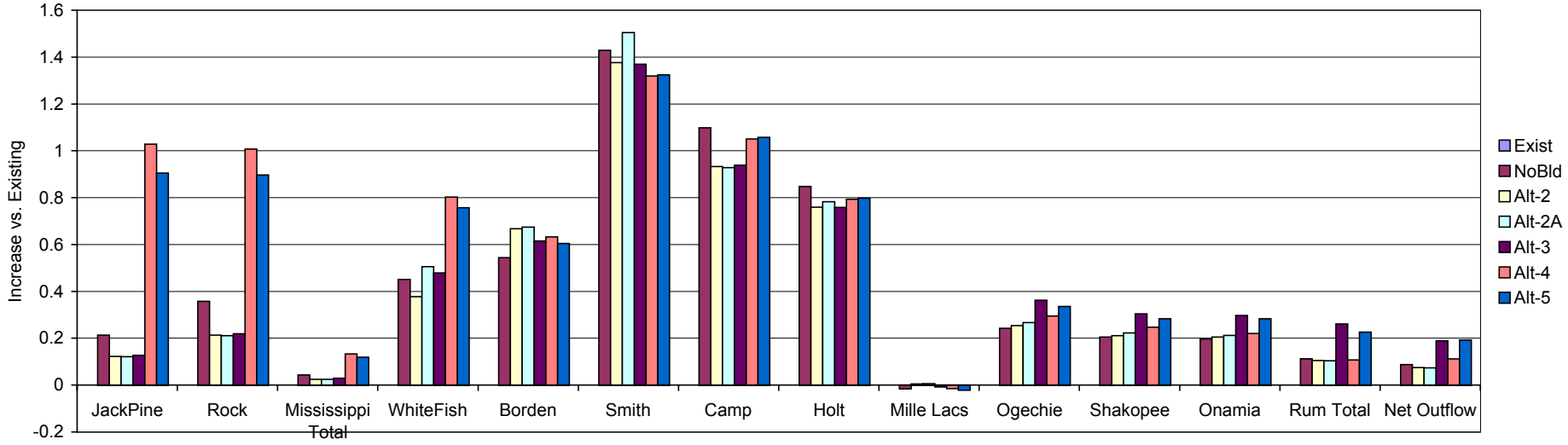




Impacts on Selected Watershed Segments

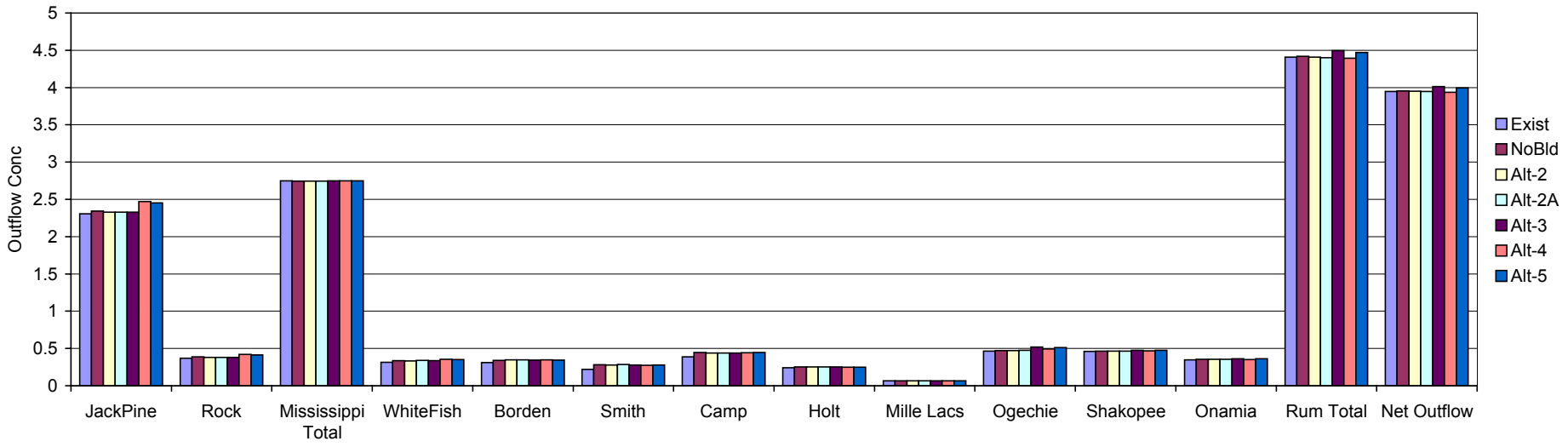
Variable: Total P **Units: ppb** **Precip: 0.7 m/yr** **Road BMPs: Yes** **Urban BMP's: Yes**

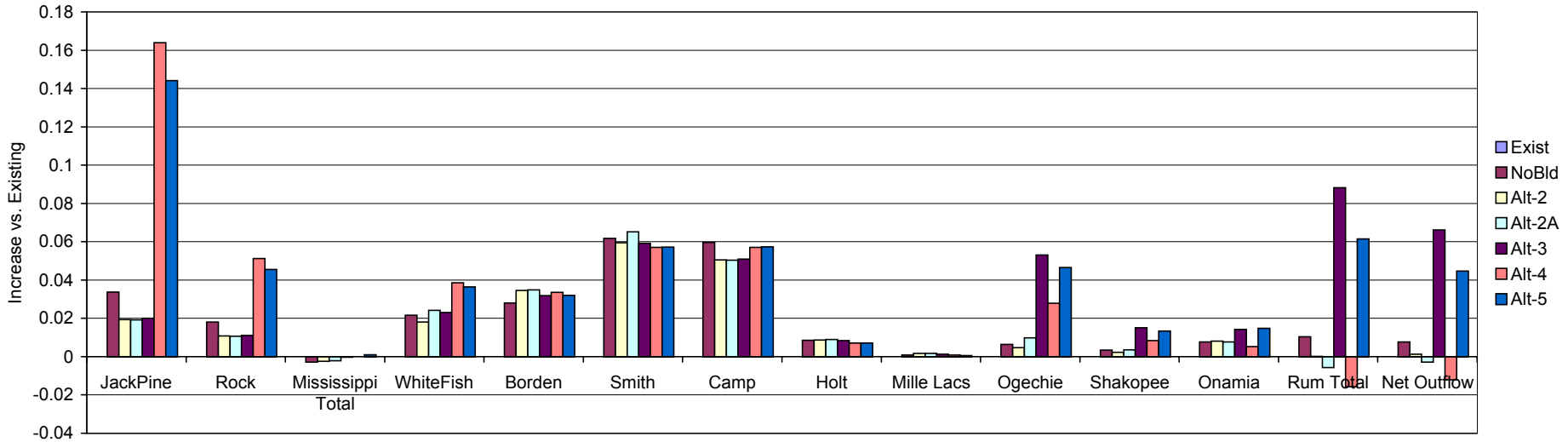




Impacts on Selected Watershed Segments D-7

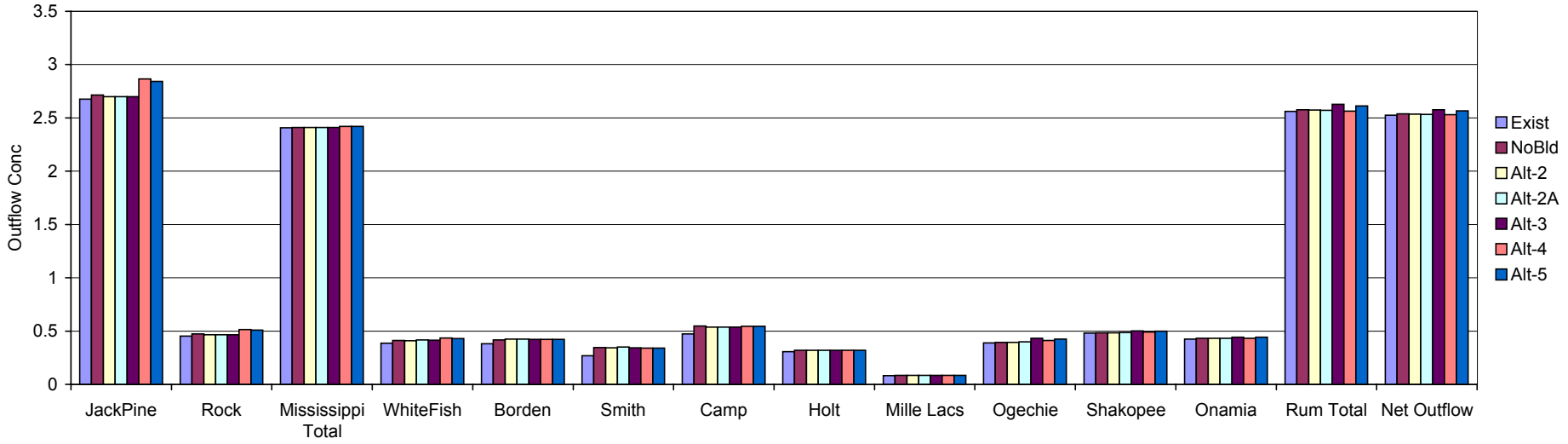
Variable: Susp. Solids Units: ppm Precip: 0.7 m/yr Road BMPs: No Urban BMP's: No

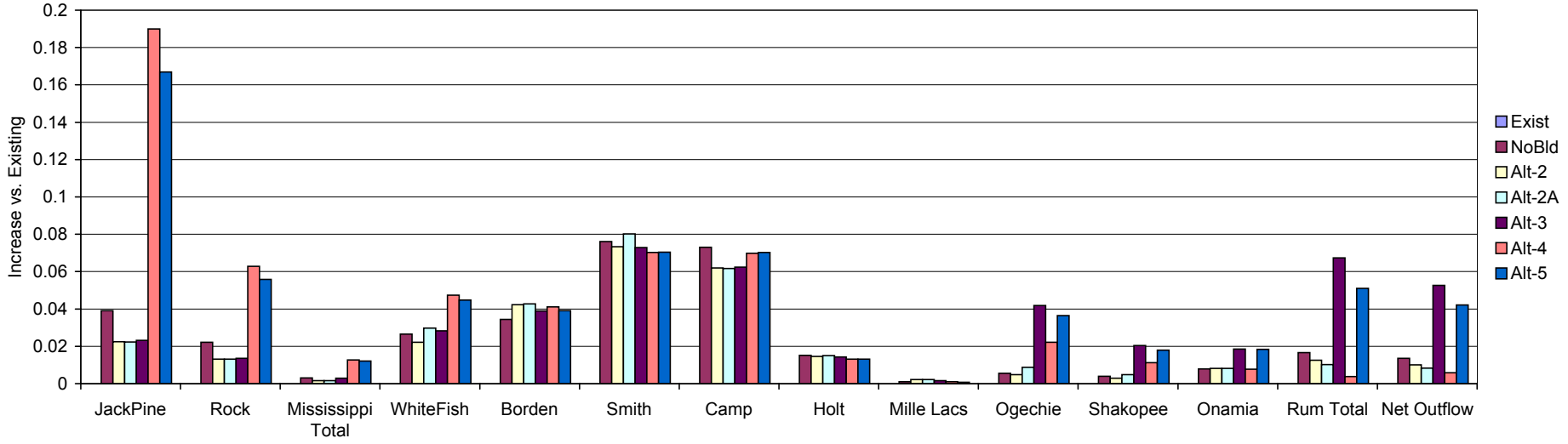




Impacts on Selected Watershed Segments

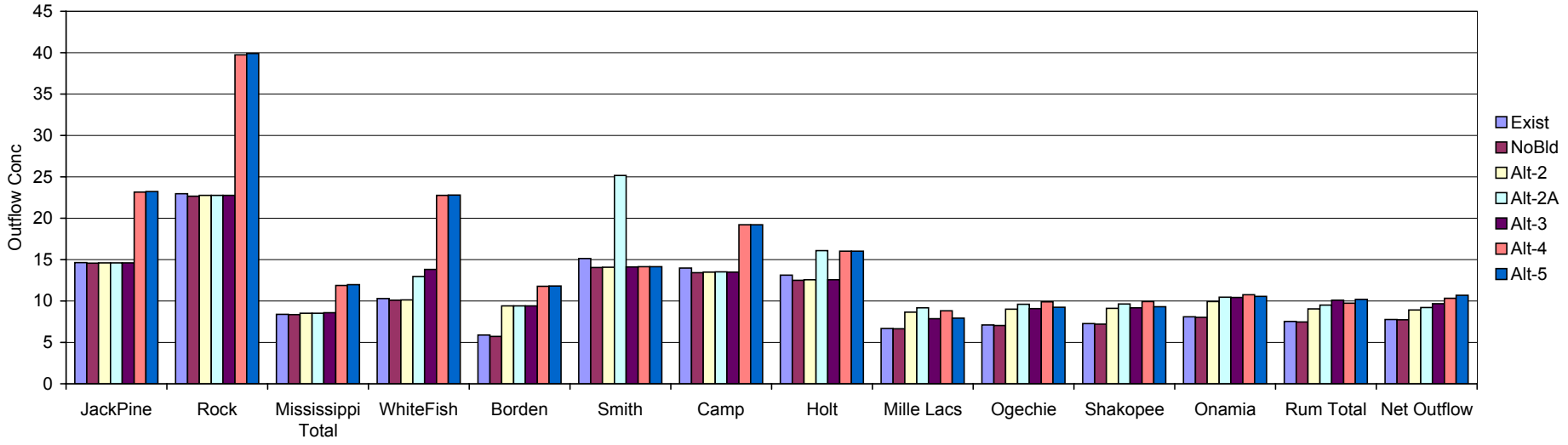
Variable: Susp. Solids **Units: ppm** **Precip: 0.87 m/yr** **Road BMPs: No** **Urban BMP's: No**

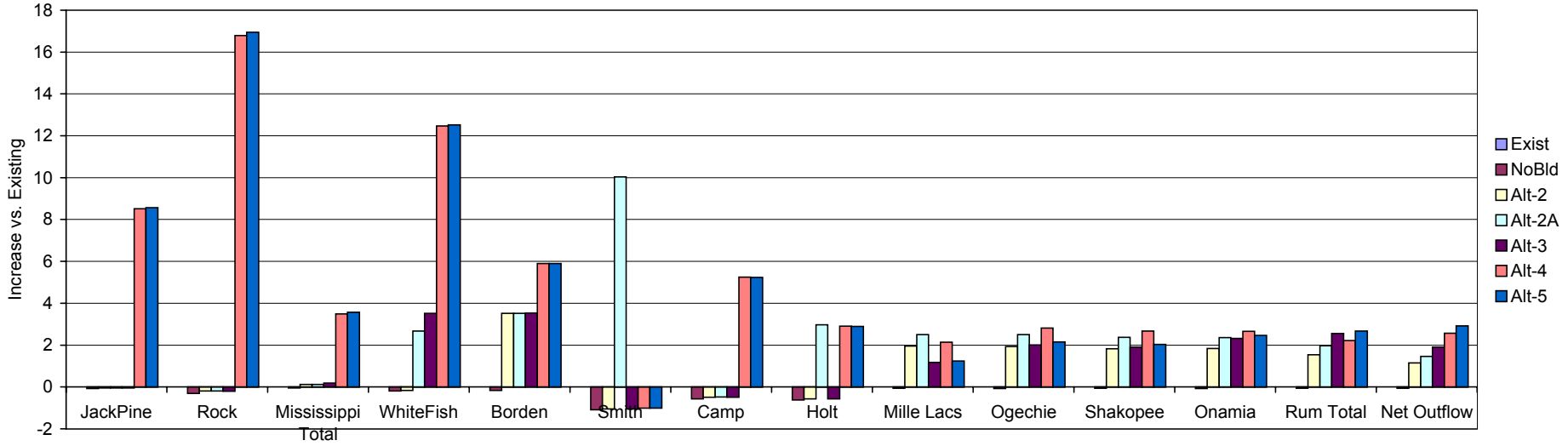




Impacts on Selected Watershed Segments

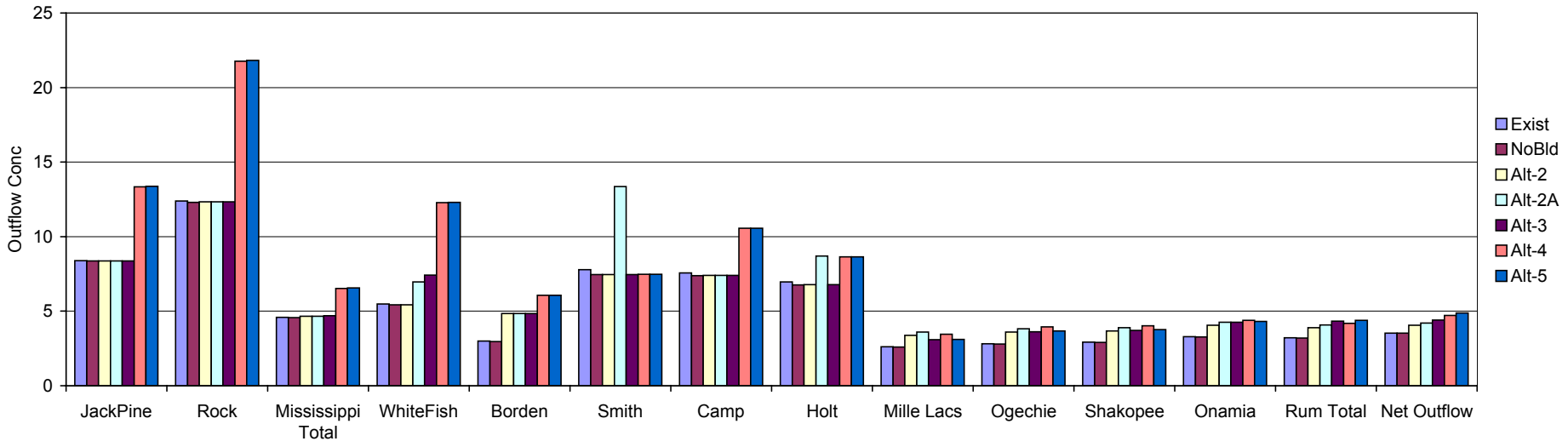
Variable: Road Salt **Units:** ppm **Precip:** 0.7 m/yr **Road BMPs:** No **Urban BMP's:** No

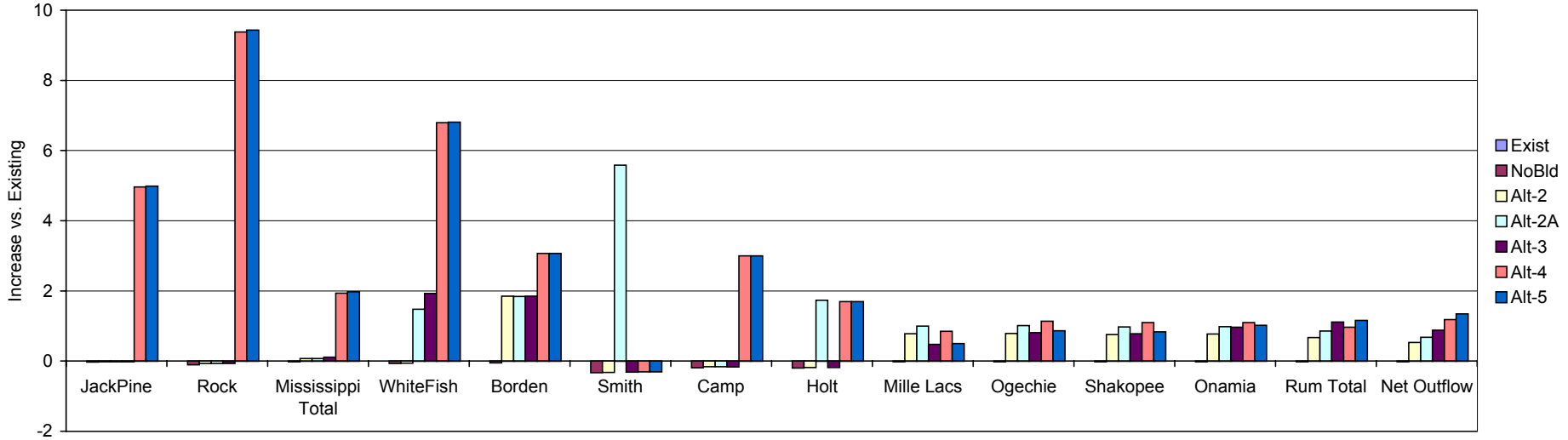




Impacts on Selected Watershed Segments D-10

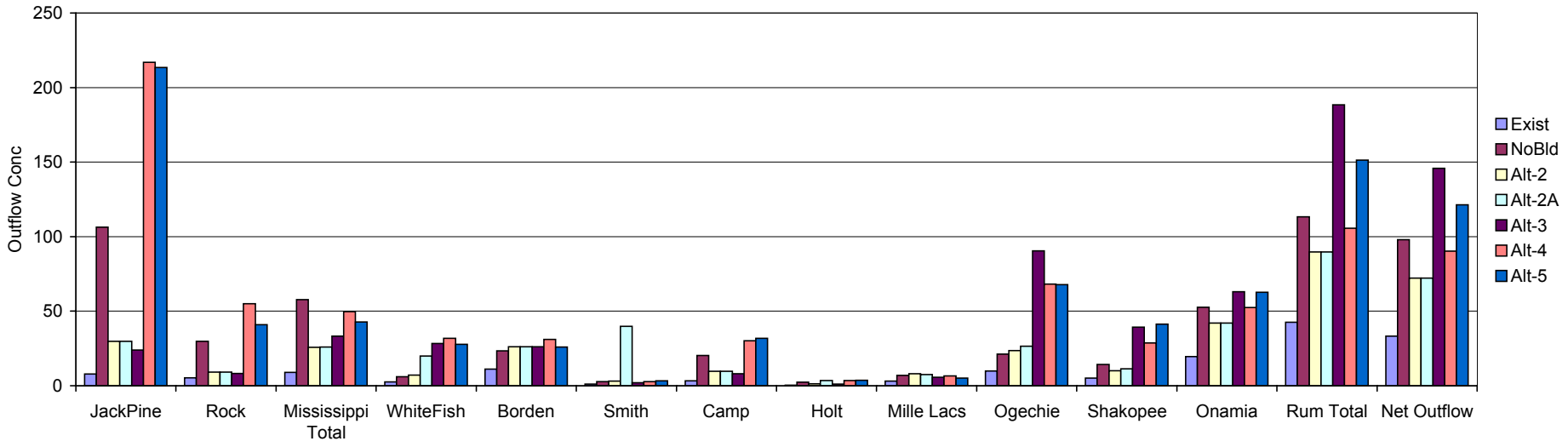
Variable: Road Salt Units: ppm Precip: 0.87 m/yr Road BMPs: No Urban BMP's: No

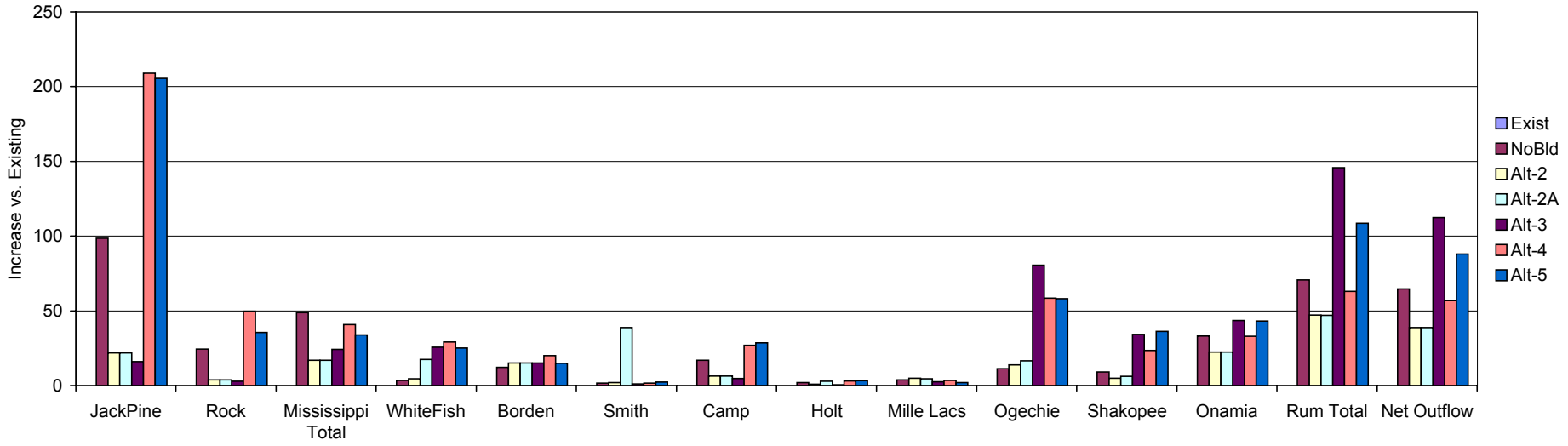




Impacts on Selected Watershed Segments D-11

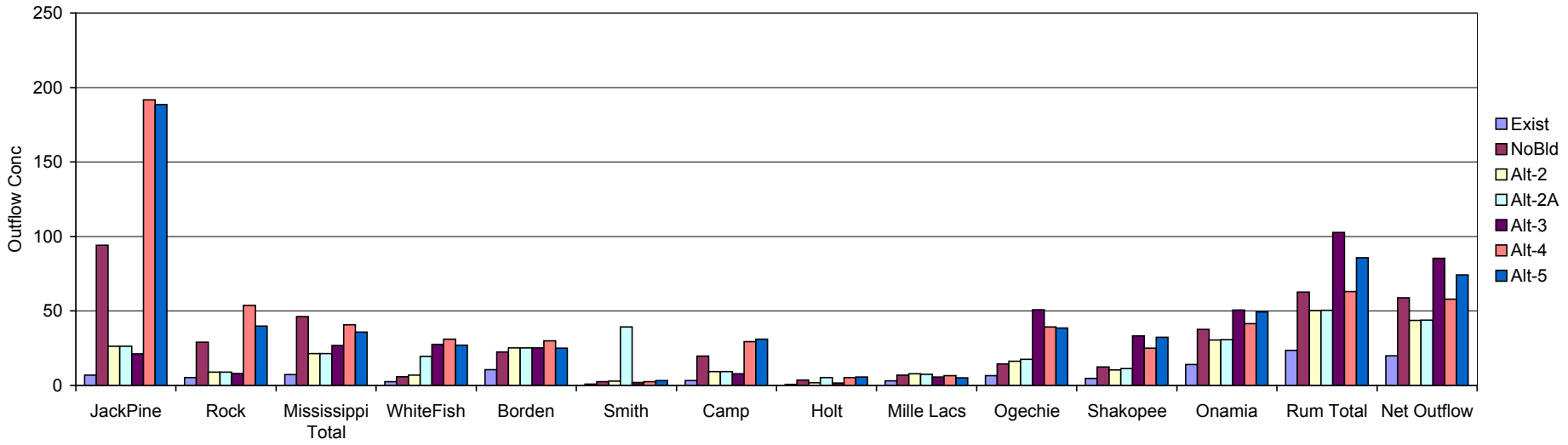
Variable: Traffic Units: rel Precip: 0.7 m/yr Road BMPs: No Urban BMP's: No

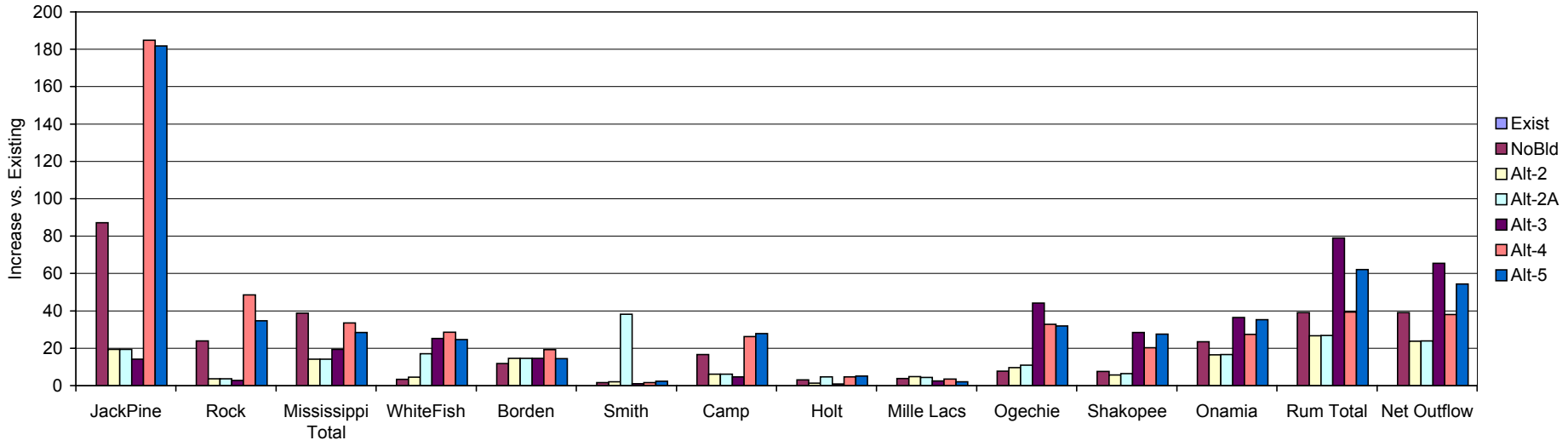




Impacts on Selected Watershed Segments

Variable: Traffic **Units: rel** **Precip: 0.87 m/yr** **Road BMPs: No** **Urban BMP's: No**





Appendix E

Segment Mass Balances for Each Alternative

Total Phosphorus, Average Precipitation

Water & Mass Balances **Alternative: Exist No Build - Existing Land Use** **Contaminant: Total P** **E-1**

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	Basin	Code	Segment	Cumulativ	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	12.02	26.99	12.24	791.0	1218.6	195.2	65.8	45.1	16.0
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.08	6.95	376.9	409.8	239.6	54.4	50.7	34.5
Grave	Miss	10109	2901.2	2901.2	93.3	4.33	4.99	4.34	252.9	271.5	165.1	58.4	54.5	38.0
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.70	4.01	3.71	198.2	206.9	153.1	53.5	51.6	41.3
Skunk	Miss	15024	3965.8	3965.8	90.3	5.92	6.56	5.93	331.6	349.6	240.0	56.0	53.3	40.5
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.1	290.9	260.9	58.4	57.6	53.1
Rock	Miss	15056	3333.0	3333.0	384.8	4.55	7.24	4.59	265.8	342.7	97.5	58.4	47.3	21.2
Platte	Miss	15055	4608.6	7941.5	721.8	5.95	15.59	10.61	335.9	577.7	190.0	56.4	37.0	17.9
Mississippi Total	Miss	1	0.0	36977.4	0.0	0.00	51.78	51.78	0.0	1603.9	1603.9		31.0	31.0
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.74	6.24	3.78	204.6	275.9	72.0	54.7	44.2	19.1
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.25	3.11	1.28	97.4	150.5	20.9	77.7	48.4	16.3
Round	Mille	1020400	636.3	1653.1	290.7	0.62	3.94	1.93	58.2	137.2	24.9	94.0	34.9	12.9
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.71	0.25	14.5	27.7	3.2	58.8	39.1	12.4
Kenney	Mille	18001900	223.4	449.4	56.3	0.28	0.92	0.53	20.5	34.9	8.4	74.4	37.8	15.7
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	11.6	17.9	3.0	62.8	44.2	15.8
Turtle	Mille	18004700	299.4	299.4	50.7	0.38	0.74	0.39	21.5	31.7	6.4	56.5	43.0	16.6
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.16	12.5	27.4	1.9	79.8	40.4	11.4
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	8.0	17.0	1.8	51.0	36.1	11.3
Borden	Mille	18002000	3955.5	6824.0	533.8	5.30	12.41	8.72	315.8	468.9	165.3	59.5	37.8	19.0
Smith	Mille	18002800	1392.1	1392.1	253.0	1.76	3.53	1.79	103.4	154.0	29.3	58.7	43.6	16.4
Camp	Mille	18001800	2542.2	2542.2	275.9	3.48	5.41	3.51	224.5	279.7	83.2	64.5	51.7	23.7
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.26	5.80	33.3	159.3	118.1	66.9	25.4	20.4
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.86	4.23	3.86	241.8	252.6	178.1	62.7	59.7	46.1
Upper Malone	MilleE	21004	2016.6	2016.6	0.0	3.04	3.04	3.04	182.8	182.8	182.8	60.1	60.1	60.1
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.39	18.53	18.43	700.7	886.4	866.2	45.5	47.8	47.0
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.56	1.28	0.57	39.7	60.2	9.5	70.6	47.1	16.5
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.92	2.92	146.5	155.9	155.9	62.4	53.4	53.4
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	168.5	168.5	168.5	60.4	60.4	60.4
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	393.9	393.9	393.9	59.5	59.5	59.5
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.07	4.20	4.07	247.2	250.9	221.3	60.7	59.7	54.3
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.69	6.69	6.69	414.2	414.2	414.2	62.0	62.0	62.0
Groundhouse	MilleE	21017	1383.9	1383.9	0.0	2.09	2.09	2.09	127.1	127.1	127.1	60.7	60.7	60.7
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.64	467.96	97.78	3705.2	17315.8	1689.2	139.1	37.0	17.3
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	27.6	38.8	8.3	61.4	46.2	18.3
Ogechie	Rum	21012	3234.9	111226.8	189.1	4.62	104.18	102.88	285.6	2020.9	1915.3	61.8	19.4	18.6
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	110.84	108.42	334.8	2320.3	2114.8	60.8	20.9	19.5
Onamia	Rum	21015	3175.8	118395.5	444.1	4.28	115.81	112.74	296.2	2499.8	2235.6	69.3	21.6	19.8
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	146.4	146.4	146.4	62.9	62.9	62.9
Rum B	Rum	21018	5488.9	125411.1	0.0	8.42	123.49	123.49	540.3	2922.3	2922.3	64.2	23.7	23.7
Rum C	Rum	21013	8139.6	8139.6	0.0	12.29	12.29	12.29	742.1	742.1	742.1	60.4	60.4	60.4
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	135.78	135.78	0.0	3664.4	3664.4		27.0	27.0
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	187.56	187.56	0.0	5268.4	5268.4		28.1	28.1

Water & Mass Balances **Alternative: NoBld No Build - Future Land Use** **Contaminant: Total P** **E-2**

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	**Basin**	**Code**	**Segment**	**Cumulativ**	**Area (ha)**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**
Bay	Miss	10035	9704.3	9704.3	2138.2	12.12	27.09	12.34	822.7	1250.4	201.7	67.9	46.2	16.3
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.09	6.95	378.0	410.9	240.2	54.5	50.8	34.6
Grave	Miss	10109	2901.2	2901.2	93.3	4.35	5.00	4.36	257.9	276.6	168.4	59.3	55.3	38.6
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.72	4.02	3.72	202.7	211.4	156.6	54.5	52.6	42.0
Skunk	Miss	15024	3965.8	3965.8	90.3	5.93	6.56	5.94	332.2	350.3	240.5	56.1	53.4	40.5
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.2	291.0	261.0	58.4	57.6	53.1
Rock	Miss	15056	3333.0	3333.0	384.8	4.61	7.30	4.65	285.0	361.9	103.9	61.8	49.5	22.4
Platte	Miss	15055	4608.6	7941.5	721.8	5.96	15.66	10.68	338.7	587.0	193.9	56.8	37.5	18.2
Mississippi Total	Miss	1	0.0	36977.4	0.0	0.00	51.99	51.99	0.0	1622.4	1622.4		31.2	31.2
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.81	6.31	3.84	225.8	297.2	78.5	59.3	47.1	20.4
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.28	3.13	1.30	104.4	157.4	22.2	81.8	50.3	17.0
Round	Mille	1020400	636.3	1653.1	290.7	0.63	3.97	1.97	63.0	143.3	26.4	99.2	36.1	13.4
Scott	Mille	18003300	226.0	226.0	66.0	0.26	0.72	0.27	18.3	31.5	3.7	70.6	43.7	14.0
Kenney	Mille	18001900	223.4	449.4	56.3	0.29	0.95	0.56	25.1	40.1	10.0	86.6	42.2	17.8
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.20	14.4	20.7	3.6	74.4	50.0	18.1
Turtle	Mille	18004700	299.4	299.4	50.7	0.39	0.75	0.40	24.7	34.8	7.2	63.1	46.7	18.2
Partridge	Mille	18004800	167.6	167.6	74.4	0.17	0.69	0.18	16.0	30.9	2.2	95.2	44.8	12.8
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.17	9.4	18.3	2.0	58.0	38.6	12.2
Borden	Mille	18002000	3955.5	6824.0	533.8	5.44	12.64	8.95	357.3	515.5	184.8	65.7	40.8	20.6
Smith	Mille	18002800	1392.1	1392.1	253.0	1.90	3.67	1.92	146.4	197.0	39.8	77.2	53.7	20.7
Camp	Mille	18001800	2542.2	2542.2	275.9	3.62	5.56	3.65	269.8	325.0	99.5	74.4	58.5	27.2
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.54	6.08	33.8	186.6	140.0	67.8	28.5	23.0
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.87	4.25	3.88	245.7	256.5	181.0	63.5	60.4	46.7
Upper Malone	MilleE	21004	2016.6	2016.6	0.0	3.05	3.05	3.05	183.9	183.9	183.9	60.4	60.4	60.4
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.40	18.54	18.44	703.6	890.4	870.2	45.7	48.0	47.2
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.57	1.28	0.58	41.4	61.9	9.8	72.9	48.2	17.0
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.93	2.93	148.7	158.5	158.5	63.2	54.1	54.1
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	169.7	169.7	169.7	60.8	60.8	60.8
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	395.3	395.3	395.3	59.7	59.7	59.7
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.08	4.21	4.08	249.3	253.0	223.2	61.1	60.1	54.7
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.70	6.70	6.70	419.7	419.7	419.7	62.6	62.6	62.6
Groundhouse	MilleE	21017	1383.9	1383.9	0.0	2.10	2.10	2.10	128.2	128.2	128.2	61.1	61.1	61.1
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.61	468.58	98.40	3696.7	17375.8	1704.7	138.9	37.1	17.3
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	27.8	38.9	8.4	61.7	46.3	18.3
Ogechie	Rum	21012	3234.9	111226.8	189.1	5.51	105.69	104.38	335.1	2086.1	1978.5	60.8	19.7	19.0
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.52	112.36	109.93	337.0	2385.8	2177.1	61.1	21.2	19.8
Onamia	Rum	21015	3175.8	118395.5	444.1	4.31	117.35	114.29	306.7	2572.6	2304.0	71.2	21.9	20.2
Rum A	Rum	21016	1526.6	1526.6	0.0	2.34	2.34	2.34	150.7	150.7	150.7	64.3	64.3	64.3
Rum B	Rum	21018	5488.9	125411.1	0.0	8.44	125.07	125.07	546.8	3001.5	3001.5	64.8	24.0	24.0
Rum C	Rum	21013	8139.6	8139.6	0.0	12.30	12.30	12.30	745.5	745.5	745.5	60.6	60.6	60.6
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	137.37	137.37	0.0	3747.1	3747.1		27.3	27.3
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	189.36	189.36	0.0	5369.5	5369.5		28.4	28.4

Water & Mass Balances **Alternative: Alt-2 Existing Alignment** **Contaminant: Total P** **E-3**

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	**Basin**	**Code**	**Segment**	**Cumulativ**	**Area (ha)**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**
Bay	Miss	10035	9704.3	9704.3	2138.2	12.10	27.07	12.31	815.2	1242.8	200.2	67.4	45.9	16.3
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.09	6.95	377.5	410.4	239.9	54.5	50.8	34.5
Grave	Miss	10109	2901.2	2901.2	93.3	4.34	5.00	4.35	255.8	274.4	167.0	58.9	54.9	38.4
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.71	4.02	3.72	200.8	209.5	155.1	54.1	52.2	41.7
Skunk	Miss	15024	3965.8	3965.8	90.3	5.93	6.56	5.94	332.0	350.0	240.3	56.0	53.4	40.5
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.2	290.9	260.9	58.4	57.6	53.1
Rock	Miss	15056	3333.0	3333.0	384.8	4.59	7.28	4.62	277.2	354.2	101.3	60.4	48.6	21.9
Platte	Miss	15055	4608.6	7941.5	721.8	5.96	15.64	10.66	337.5	583.2	192.3	56.7	37.3	18.1
Mississippi Total	Miss	1	0.0	36977.4	0.0	0.00	51.92	51.92	0.0	1615.8	1615.8		31.1	31.1
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.80	6.30	3.83	222.4	293.7	77.5	58.5	46.7	20.2
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.27	3.13	1.30	102.0	155.0	21.7	80.4	49.6	16.8
Round	Mille	1020400	636.3	1653.1	290.7	0.63	3.96	1.95	60.9	140.8	25.8	97.0	35.6	13.2
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.72	0.26	16.8	30.0	3.5	65.9	41.8	13.4
Kenney	Mille	18001900	223.4	449.4	56.3	0.30	0.96	0.57	29.8	44.6	11.3	97.8	46.4	19.7
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	13.2	19.5	3.3	69.6	47.6	17.1
Turtle	Mille	18004700	299.4	299.4	50.7	0.39	0.74	0.39	23.3	33.5	6.9	60.3	45.1	17.5
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.17	14.5	29.4	2.1	88.9	43.0	12.2
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	8.8	17.7	1.9	55.1	37.5	11.8
Borden	Mille	18002000	3955.5	6824.0	533.8	5.47	12.65	8.96	366.9	524.9	188.4	67.1	41.5	21.0
Smith	Mille	18002800	1392.1	1392.1	253.0	1.89	3.66	1.92	144.8	195.4	39.4	76.5	53.3	20.5
Camp	Mille	18001800	2542.2	2542.2	275.9	3.60	5.53	3.63	262.9	318.1	97.0	73.0	57.5	26.7
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.52	6.05	34.0	183.8	137.8	68.0	28.2	22.8
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.87	4.25	3.88	245.7	256.5	181.0	63.5	60.4	46.7
Upper Malone	MilleE	21004	2016.6	2016.6	0.0	3.05	3.05	3.05	183.9	183.9	183.9	60.4	60.4	60.4
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.40	18.54	18.44	703.6	890.4	870.2	45.7	48.0	47.2
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.57	1.28	0.58	41.4	61.9	9.8	72.9	48.2	17.0
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.93	2.93	148.7	158.5	158.5	63.2	54.1	54.1
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	169.7	169.7	169.7	60.8	60.8	60.8
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	395.3	395.3	395.3	59.7	59.7	59.7
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.08	4.21	4.08	249.3	253.0	223.2	61.1	60.1	54.7
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.70	6.70	6.70	419.7	419.7	419.7	62.6	62.6	62.6
Groundhouse	MilleE	21017	1383.9	1383.9	0.0	2.10	2.10	2.10	128.2	128.2	128.2	61.1	61.1	61.1
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.82	468.77	98.58	3762.4	17441.8	1714.1	140.3	37.2	17.4
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	27.7	38.8	8.3	61.5	46.3	18.3
Ogechie	Rum	21012	3234.9	111226.8	189.1	5.51	105.87	104.56	333.7	2093.9	1986.2	60.6	19.8	19.0
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	112.53	110.11	336.1	2392.5	2183.5	61.0	21.3	19.8
Onamia	Rum	21015	3175.8	118395.5	444.1	4.31	117.53	114.47	307.9	2580.2	2311.2	71.4	22.0	20.2
Rum A	Rum	21016	1526.6	1526.6	0.0	2.34	2.34	2.34	150.7	150.7	150.7	64.3	64.3	64.3
Rum B	Rum	21018	5488.9	125411.1	0.0	8.43	125.24	125.24	545.7	3007.7	3007.7	64.7	24.0	24.0
Rum C	Rum	21013	8139.6	8139.6	0.0	12.30	12.30	12.30	744.1	744.1	744.1	60.5	60.5	60.5
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	137.54	137.54	0.0	3751.7	3751.7		27.3	27.3
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	189.46	189.46	0.0	5367.5	5367.5		28.3	28.3

Water & Mass Balances **Alternative: Alt-2A Casino & Bays Bypass** **Contaminant: Total P** **E-4**

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	Basin	Code	Segment	Cumulativ	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	12.09	27.06	12.31	813.3	1240.9	199.8	67.2	45.9	16.2
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.09	6.95	377.5	410.4	239.9	54.5	50.8	34.5
Grave	Miss	10109	2901.2	2901.2	93.3	4.34	4.99	4.35	255.8	274.4	167.0	58.9	54.9	38.4
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.71	4.02	3.72	200.8	209.5	155.1	54.1	52.1	41.7
Skunk	Miss	15024	3965.8	3965.8	90.3	5.93	6.56	5.94	332.0	350.0	240.3	56.0	53.4	40.5
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.2	290.9	260.9	58.4	57.6	53.1
Rock	Miss	15056	3333.0	3333.0	384.8	4.59	7.28	4.62	277.1	354.1	101.3	60.4	48.6	21.9
Platte	Miss	15055	4608.6	7941.5	721.8	5.96	15.64	10.65	337.5	583.1	192.3	56.6	37.3	18.0
Mississippi Total	Miss	1	0.0	36977.4	0.0	0.00	51.91	51.91	0.0	1615.3	1615.3		31.1	31.1
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.82	6.32	3.85	228.5	299.8	79.4	59.8	47.5	20.6
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.27	3.13	1.30	102.0	155.0	21.7	80.4	49.6	16.8
Round	Mille	1020400	636.3	1653.1	290.7	0.63	3.96	1.95	60.9	140.8	25.7	97.0	35.6	13.2
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.72	0.26	16.8	30.0	3.5	65.9	41.8	13.4
Kenney	Mille	18001900	223.4	449.4	56.3	0.31	0.96	0.57	30.1	44.8	11.3	98.4	46.7	19.8
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	13.2	19.5	3.3	69.6	47.5	17.1
Turtle	Mille	18004700	299.4	299.4	50.7	0.39	0.74	0.39	23.3	33.5	6.9	60.3	45.1	17.5
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.17	14.5	29.4	2.1	88.8	43.0	12.2
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	8.8	17.7	1.9	55.0	37.5	11.8
Borden	Mille	18002000	3955.5	6824.0	533.8	5.47	12.65	8.97	367.4	525.4	188.6	67.2	41.5	21.0
Smith	Mille	18002800	1392.1	1392.1	253.0	1.90	3.68	1.93	148.7	199.3	40.4	78.1	54.2	20.9
Camp	Mille	18001800	2542.2	2542.2	275.9	3.60	5.53	3.63	262.7	317.9	96.9	72.9	57.5	26.7
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.53	6.07	34.0	184.7	138.6	68.0	28.3	22.8
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.87	4.25	3.88	245.7	256.5	181.0	63.5	60.4	46.7
Upper Malone	MilleE	21004	2016.6	2016.6	0.0	3.05	3.05	3.05	183.9	183.9	183.9	60.4	60.4	60.4
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.40	18.54	18.44	703.6	890.4	870.2	45.7	48.0	47.2
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.57	1.28	0.58	41.4	61.9	9.8	72.9	48.2	17.0
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.93	2.93	148.7	158.5	158.5	63.2	54.1	54.1
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	169.7	169.7	169.7	60.8	60.8	60.8
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	395.3	395.3	395.3	59.7	59.7	59.7
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.08	4.21	4.08	249.3	253.0	223.2	61.1	60.1	54.7
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.70	6.70	6.70	419.7	419.7	419.7	62.6	62.6	62.6
Groundhouse	MilleE	21017	1383.9	1383.9	0.0	2.10	2.10	2.10	128.2	128.2	128.2	61.1	61.1	61.1
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.83	468.81	98.62	3764.6	17446.9	1715.2	140.3	37.2	17.4
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	27.7	38.8	8.3	61.5	46.3	18.3
Ogechie	Rum	21012	3234.9	111226.8	189.1	5.52	105.92	104.62	338.1	2099.5	1991.5	61.3	19.8	19.0
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	112.59	110.16	336.0	2397.8	2188.4	61.0	21.3	19.9
Onamia	Rum	21015	3175.8	118395.5	444.1	4.31	117.58	114.52	306.6	2583.9	2314.6	71.2	22.0	20.2
Rum A	Rum	21016	1526.6	1526.6	0.0	2.34	2.34	2.34	149.8	149.8	149.8	64.0	64.0	64.0
Rum B	Rum	21018	5488.9	125411.1	0.0	8.43	125.29	125.29	544.8	3009.2	3009.2	64.6	24.0	24.0
Rum C	Rum	21013	8139.6	8139.6	0.0	12.30	12.30	12.30	744.1	744.1	744.1	60.5	60.5	60.5
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	137.59	137.59	0.0	3753.2	3753.2		27.3	27.3
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	189.50	189.50	0.0	5368.6	5368.6		28.3	28.3

Water & Mass Balances **Alternative: Alt-3 Partial Southern Bypass** **Contaminant: Total P** **E-5**

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	Basin	Code	Segment	Cumulativ	Area (ha)	Local In	Total In	Outflow	Local In	Total In	Outflow	Local In	Total In	Outflow
Bay	Miss	10035	9704.3	9704.3	2138.2	12.08	27.04	12.29	807.2	1234.8	198.5	66.8	45.7	16.2
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.09	6.95	377.5	410.5	240.0	54.5	50.8	34.5
Grave	Miss	10109	2901.2	2901.2	93.3	4.34	5.00	4.35	255.9	274.5	167.1	58.9	55.0	38.4
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.71	4.02	3.72	200.9	209.6	155.1	54.1	52.2	41.7
Skunk	Miss	15024	3965.8	3965.8	90.3	5.93	6.56	5.94	332.0	350.0	240.3	56.0	53.4	40.5
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.9	291.7	261.7	58.5	57.8	53.2
Rock	Miss	15056	3333.0	3333.0	384.8	4.59	7.28	4.63	277.6	354.5	101.4	60.5	48.7	21.9
Platte	Miss	15055	4608.6	7941.5	721.8	5.96	15.64	10.66	337.6	583.4	192.4	56.7	37.3	18.1
Mississippi Total	Miss	1	0.0	36977.4	0.0	0.00	51.90	51.90	0.0	1615.1	1615.1		31.1	31.1
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.81	6.31	3.85	227.2	298.6	79.0	59.6	47.3	20.5
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.27	3.13	1.30	102.1	155.1	21.7	80.5	49.6	16.8
Round	Mille	1020400	636.3	1653.1	290.7	0.63	3.96	1.95	61.0	140.9	25.8	97.1	35.6	13.2
Scott	Mille	18003300	226.0	226.0	66.0	0.25	0.72	0.26	16.8	30.0	3.5	66.1	41.9	13.4
Kenney	Mille	18001900	223.4	449.4	56.3	0.30	0.96	0.57	28.5	43.3	10.9	94.8	45.3	19.2
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	13.3	19.6	3.3	69.8	47.7	17.2
Turtle	Mille	18004700	299.4	299.4	50.7	0.39	0.74	0.39	23.4	33.5	6.9	60.4	45.2	17.5
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.17	14.6	29.5	2.1	89.2	43.1	12.3
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	8.8	17.8	1.9	55.2	37.6	11.8
Borden	Mille	18002000	3955.5	6824.0	533.8	5.45	12.63	8.95	362.9	520.6	186.6	66.5	41.2	20.9
Smith	Mille	18002800	1392.1	1392.1	253.0	1.89	3.66	1.92	144.5	195.1	39.3	76.4	53.3	20.5
Camp	Mille	18001800	2542.2	2542.2	275.9	3.60	5.53	3.63	263.1	318.3	97.0	73.0	57.5	26.7
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.52	6.05	33.9	183.8	137.8	67.9	28.2	22.8
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.87	4.25	3.88	245.7	256.5	181.0	63.5	60.4	46.7
Upper Malone	MilleE	21004	2016.6	2016.6	0.0	3.05	3.05	3.05	183.9	183.9	183.9	60.4	60.4	60.4
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.40	18.54	18.44	703.6	890.4	870.2	45.7	48.0	47.2
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.57	1.28	0.58	41.4	61.9	9.8	72.9	48.2	17.0
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.93	2.93	148.7	158.5	158.5	63.2	54.1	54.1
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	169.7	169.7	169.7	60.8	60.8	60.8
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	395.3	395.3	395.3	59.7	59.7	59.7
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.08	4.21	4.08	249.3	253.0	223.2	61.1	60.1	54.7
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.70	6.70	6.70	419.7	419.7	419.7	62.6	62.6	62.6
Groundhouse	MilleE	21017	1383.9	1383.9	0.0	2.10	2.10	2.10	128.2	128.2	128.2	61.1	61.1	61.1
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.70	468.65	98.47	3725.7	17404.8	1708.6	139.5	37.1	17.4
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	28.4	39.5	8.5	62.7	46.9	18.6
Ogechie	Rum	21012	3234.9	111226.8	189.1	5.64	105.89	104.58	375.4	2130.4	2020.8	66.6	20.1	19.3
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	112.55	110.13	336.1	2427.1	2215.2	61.0	21.6	20.1
Onamia	Rum	21015	3175.8	118395.5	444.1	4.33	117.57	114.50	312.8	2616.8	2344.0	72.3	22.3	20.5
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	146.4	146.4	146.4	62.9	62.9	62.9
Rum B	Rum	21018	5488.9	125411.1	0.0	8.50	125.33	125.33	566.0	3056.5	3056.5	66.6	24.4	24.4
Rum C	Rum	21013	8139.6	8139.6	0.0	12.38	12.38	12.38	768.8	768.8	768.8	62.1	62.1	62.1
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	137.71	137.71	0.0	3825.3	3825.3		27.8	27.8
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	189.61	189.61	0.0	5440.4	5440.4		28.7	28.7

Water & Mass Balances **Alternative: Alt-4 Partial Northern Bypass** **Contaminant: Total P** **E-6**

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	**Basin**	**Code**	**Segment**	**Cumulativ**	**Area (ha)**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**
Bay	Miss	10035	9704.3	9704.3	2138.2	12.20	27.17	12.41	846.3	1273.9	206.5	69.4	46.9	16.6
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.09	6.95	377.5	410.4	239.9	54.4	50.8	34.5
Grave	Miss	10109	2901.2	2901.2	93.3	4.38	5.03	4.39	266.3	285.0	174.0	60.9	56.7	39.7
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.77	4.08	3.78	220.2	228.9	170.2	58.3	56.1	45.0
Skunk	Miss	15024	3965.8	3965.8	90.3	5.93	6.56	5.94	332.0	350.0	240.3	56.0	53.4	40.5
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.2	290.9	260.9	58.4	57.6	53.1
Rock	Miss	15056	3333.0	3333.0	384.8	4.72	7.42	4.76	320.3	397.2	116.0	67.8	53.6	24.4
Platte	Miss	15055	4608.6	7941.5	721.8	5.96	15.77	10.79	337.5	597.9	198.9	56.6	37.9	18.4
Mississippi Total	Miss	1	0.0	36977.4	0.0	0.00	52.25	52.25	0.0	1650.7	1650.7		31.6	31.6
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.86	6.36	3.90	242.6	313.9	83.8	62.8	49.4	21.5
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.27	3.12	1.30	102.0	155.0	21.7	80.4	49.6	16.8
Round	Mille	1020400	636.3	1653.1	290.7	0.63	3.96	1.95	60.9	140.7	25.7	97.0	35.6	13.2
Scott	Mille	18003300	226.0	226.0	66.0	0.26	0.72	0.26	17.8	31.0	3.6	69.0	43.1	13.8
Kenney	Mille	18001900	223.4	449.4	56.3	0.28	0.94	0.55	23.1	38.0	9.4	81.5	40.3	16.9
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	13.2	19.5	3.3	69.5	47.5	17.1
Turtle	Mille	18004700	299.4	299.4	50.7	0.39	0.74	0.39	23.3	33.5	6.8	60.3	45.1	17.5
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.17	14.5	29.4	2.1	88.7	42.9	12.2
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	8.8	17.7	1.9	55.0	37.5	11.8
Borden	Mille	18002000	3955.5	6824.0	533.8	5.46	12.63	8.94	365.6	521.7	186.9	66.9	41.3	20.9
Smith	Mille	18002800	1392.1	1392.1	253.0	1.89	3.66	1.91	143.0	193.6	38.9	75.8	52.9	20.4
Camp	Mille	18001800	2542.2	2542.2	275.9	3.62	5.55	3.65	267.8	323.0	98.8	74.0	58.2	27.1
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.53	6.06	33.6	184.7	138.6	67.4	28.3	22.9
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.87	4.25	3.88	245.7	256.5	181.0	63.5	60.4	46.7
Upper Malone	MilleE	21004	2016.6	2016.6	0.0	3.05	3.05	3.05	183.9	183.9	183.9	60.4	60.4	60.4
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.40	18.54	18.44	703.6	890.4	870.2	45.7	48.0	47.2
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.57	1.28	0.58	41.4	61.9	9.8	72.9	48.2	17.0
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.93	2.93	148.7	158.5	158.5	63.2	54.1	54.1
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	169.7	169.7	169.7	60.8	60.8	60.8
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	395.3	395.3	395.3	59.7	59.7	59.7
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.08	4.21	4.08	249.3	253.0	223.2	61.1	60.1	54.7
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.70	6.70	6.70	419.7	419.7	419.7	62.6	62.6	62.6
Groundhouse	MilleE	21017	1383.9	1383.9	0.0	2.10	2.10	2.10	128.2	128.2	128.2	61.1	61.1	61.1
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.60	468.60	98.42	3694.6	17379.7	1705.4	138.9	37.1	17.3
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	27.7	38.8	8.3	61.5	46.3	18.3
Ogechie	Rum	21012	3234.9	111226.8	189.1	5.57	105.77	104.46	353.8	2105.4	1996.9	63.5	19.9	19.1
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	112.43	110.01	336.0	2403.2	2193.1	61.0	21.4	19.9
Onamia	Rum	21015	3175.8	118395.5	444.1	4.29	117.41	114.34	301.1	2583.0	2313.4	70.2	22.0	20.2
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	146.4	146.4	146.4	62.9	62.9	62.9
Rum B	Rum	21018	5488.9	125411.1	0.0	8.42	125.09	125.09	541.8	3001.7	3001.7	64.3	24.0	24.0
Rum C	Rum	21013	8139.6	8139.6	0.0	12.30	12.30	12.30	744.0	744.0	744.0	60.5	60.5	60.5
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	137.39	137.39	0.0	3745.7	3745.7		27.3	27.3
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	189.64	189.64	0.0	5396.4	5396.4		28.5	28.5

Water & Mass Balances **Alternative: Alt-5 Full Bypass** **Contaminant: Total P**

Road BMPs: No **Urban BMP's: No** **Precip: 0.7 m/yr**

		Segment	Drainage Area (ha)		Lake	Flow (hm3/yr)			Loads (kg/yr)			Concentrations (ppb)		
Segment	**Basin**	**Code**	**Segment**	**Cumulativ**	**Area (ha)**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**	**Local In**	**Total In**	**Outflow**
Bay	Miss	10035	9704.3	9704.3	2138.2	12.18	27.15	12.39	839.7	1267.4	205.2	69.0	46.7	16.6
Nokay	Miss	10107	4726.3	4726.3	164.6	6.93	8.09	6.95	377.5	410.5	240.0	54.5	50.8	34.5
Grave	Miss	10109	2901.2	2901.2	93.3	4.37	5.02	4.38	264.1	282.7	172.5	60.5	56.3	39.4
Noname A	Miss	10110	2044.8	2044.8	0.0	3.08	3.08	3.08	160.0	160.0	160.0	52.0	52.0	52.0
JackPine	Miss	10120	2489.8	2489.8	43.5	3.77	4.07	3.77	217.6	226.3	168.1	57.8	55.6	44.6
Skunk	Miss	15024	3965.8	3965.8	90.3	5.93	6.56	5.94	332.0	350.0	240.3	56.0	53.4	40.5
Noname B	Miss	15025	3203.6	3203.6	18.8	4.92	5.05	4.92	287.9	291.7	261.7	58.5	57.8	53.2
Rock	Miss	15056	3333.0	3333.0	384.8	4.70	7.40	4.74	314.3	391.2	113.9	66.8	52.9	24.0
Platte	Miss	15055	4608.6	7941.5	721.8	5.96	15.75	10.77	337.5	595.8	198.0	56.7	37.8	18.4
Mississippi Total	Miss	1	0.0	36977.4	0.0	0.00	52.20	52.20	0.0	1645.6	1645.6		31.5	31.5
WhiteFish	Mille	18000100	2816.2	2816.2	356.8	3.86	6.35	3.89	240.4	311.8	83.1	62.4	49.1	21.4
BigPine	Mille	1015700	1016.8	1016.8	265.2	1.27	3.13	1.30	102.1	155.1	21.7	80.4	49.6	16.8
Round	Mille	1020400	636.3	1653.1	290.7	0.63	3.96	1.95	61.0	140.9	25.8	97.1	35.6	13.2
Scott	Mille	18003300	226.0	226.0	66.0	0.26	0.72	0.26	17.6	30.8	3.6	68.4	42.8	13.7
Kenney	Mille	18001900	223.4	449.4	56.3	0.28	0.94	0.55	23.2	38.0	9.4	81.7	40.4	17.0
Miller	Mille	18002100	149.4	149.4	31.6	0.19	0.41	0.19	13.3	19.6	3.3	69.7	47.6	17.2
Turtle	Mille	18004700	299.4	299.4	50.7	0.39	0.74	0.39	23.4	33.5	6.9	60.4	45.2	17.5
Partridge	Mille	18004800	167.6	167.6	74.4	0.16	0.68	0.17	14.6	29.4	2.1	89.1	43.0	12.3
Chrysler	Mille	18009500	149.6	149.6	44.7	0.16	0.47	0.16	8.8	17.7	1.9	55.1	37.6	11.8
Borden	Mille	18002000	3955.5	6824.0	533.8	5.46	12.62	8.94	363.3	519.4	186.0	66.6	41.2	20.8
Smith	Mille	18002800	1392.1	1392.1	253.0	1.89	3.66	1.91	143.2	193.8	39.0	75.9	53.0	20.4
Camp	Mille	18001800	2542.2	2542.2	275.9	3.62	5.55	3.65	268.1	323.3	98.8	74.1	58.2	27.1
Holt	Mille	18002900	388.2	4322.4	67.4	0.50	6.53	6.06	33.6	184.9	138.7	67.4	28.3	22.9
Twenty	MilleE	1008500	2584.9	2584.9	53.9	3.87	4.25	3.88	245.7	256.5	181.0	63.5	60.4	46.7
Upper Malone	MilleE	21004	2016.6	2016.6	0.0	3.05	3.05	3.05	183.9	183.9	183.9	60.4	60.4	60.4
Thaines	MilleE	21003	2614.7	4631.3	14.3	15.40	18.54	18.44	703.6	890.4	870.2	45.7	48.0	47.2
Cedar Lake	MilleE	1006500	460.0	460.0	102.2	0.57	1.28	0.58	41.4	61.9	9.8	72.9	48.2	17.0
Cedar Ck	MilleE	21005	1540.3	2000.3	0.0	2.35	2.93	2.93	148.7	158.5	158.5	63.2	54.1	54.1
Seventeen	MilleE	21006	1845.7	1845.7	0.0	2.79	2.79	2.79	169.7	169.7	169.7	60.8	60.8	60.8
Ditch 36	MilleE	21007	4398.9	4398.9	0.0	6.62	6.62	6.62	395.3	395.3	395.3	59.7	59.7	59.7
Malmo	MilleE	21008	2711.6	2711.6	18.2	4.08	4.21	4.08	249.3	253.0	223.2	61.1	60.1	54.7
Peterson	MilleE	21010	4399.4	4399.4	0.0	6.70	6.70	6.70	419.7	419.7	419.7	62.6	62.6	62.6
Groundhouse	MilleE	21017	1383.9	1383.9	0.0	2.10	2.10	2.10	128.2	128.2	128.2	61.1	61.1	61.1
Mille Lacs	Mille	48001200	69720.6	107639.4	53650.0	26.54	468.53	98.35	3676.1	17359.7	1702.3	138.5	37.1	17.3
Twelve	Rum	49000600	352.5	352.5	55.6	0.45	0.84	0.46	28.4	39.5	8.5	62.7	46.9	18.6
Ogechie	Rum	21012	3234.9	111226.8	189.1	5.62	105.75	104.44	369.9	2118.6	2009.4	65.8	20.0	19.2
Shakopee	Rum	21014	3992.9	115219.7	351.2	5.51	112.41	109.99	336.1	2415.7	2204.5	61.0	21.5	20.0
Onamia	Rum	21015	3175.8	118395.5	444.1	4.33	117.43	114.37	314.5	2607.8	2335.7	72.5	22.2	20.4
Rum A	Rum	21016	1526.6	1526.6	0.0	2.33	2.33	2.33	146.4	146.4	146.4	62.9	62.9	62.9
Rum B	Rum	21018	5488.9	125411.1	0.0	8.47	125.17	125.17	556.2	3038.4	3038.4	65.7	24.3	24.3
Rum C	Rum	21013	8139.6	8139.6	0.0	12.36	12.36	12.36	763.4	763.4	763.4	61.8	61.8	61.8
Rum Total	Rum	2	0.0	133550.6	0.0	0.00	137.53	137.53	0.0	3801.8	3801.8		27.6	27.6
Net Outflow	Net	3	0.0	170528.0	0.0	0.00	189.72	189.72	0.0	5447.4	5447.4		28.7	28.7