

PUBLIC SCHOOLS FLEET MANAGEMENT AND MAINTENANCE

Introduction

The Metropolitan Nashville Public Schools (MNPS) fleet management and maintenance program currently employs thirty-six full time equivalent employees (FTE's). These individuals maintain 539 school buses.

Organizationally, MNPS fleet management and maintenance is part of the MNPS Department of Transportation (DOT). The DOT's mission is, "to transport students to and from school, on special field trips, and to and from extracurricular events in a timely, safe and cost-effective manner". To attain its mission the DOT performs the following functions:

- Administration
- Vehicle Acquisition
- Bus Operations
- Bus Routing
- Special Education Transportation
- Training and Certification
- Bus Maintenance

The MNPS fleet management and maintenance facility is part of the Department of Transportation's headquarters facility.

The MNPS also operates 165 maintenance and operations vehicles. These are not maintained at the school bus facility, nor are they operated by the DOT. These vehicles are maintained by 4 mechanics within the plant maintenance and operations groups. Repair cost information is not readily available, since the costs are intermingled with other items.

The portion of the DOT budget for the 2001–2002 fiscal year related to bus fleet management and maintenance is slightly over \$2,000,000.

Executive Summary

In general, we found the Metropolitan Nashville Public Schools fleet management and maintenance program to be struggling in several critical areas.

The MNPS was the subject of a recent performance audit performed by MGT of America, Inc. A portion of the audit reviewed the Department of Transportation. TCI used this previous report as a starting point for its observations. Management was responsive to and supportive of TCI's visit. It should be noted that the present management team has been in place at the Department of Transportation for only two years.

The items listed below will be commented on in the body of the report.

More specifically, with regard to bus fleet operations:

- Management has been responsive to the recommendations contained in the MGT report. For example, bus purchases for the last fiscal year were reduced by 17. The number of mechanics has been reduced by five as well.
- Most members of the DOT management team are new to their current position. With the exception of the Shop Foreman, all key managers and supervisors have been in their jobs for less than two years. The previous transportation management team had been in place for over 30 years and had apparently not managed the maintenance shop operation very actively. Some of the changes instituted by the new team have been resisted by the organization.
- Based on our observations, maintenance of the fleet was poor. Detailed inspections of the equipment revealed safety and operating defects that resulted in buses being taken out of service for repair. Many of the vehicles inspected had recently gone through State inspection, MNPS inspection, or both. Because of the poor condition of the MNPS buses, TCI was asked to conduct a weekend inspection of a larger sample of buses. Fifty-five buses were inspected and a total of 413 defects were detected on those buses. Of these defects, 177 were safety related. In addition to the mechanical defects, 19 of the 55 buses had tires that were in need of replacement or were seriously under-inflated.
- An atmosphere of hostility and tension exists between transportation management and shop employees, resulting in the Director of Transportation requesting that a Human Resources person be physically located within the DOT. TCI agrees with this request.
- Three employees are classified in mechanic slots while performing other functions.
- The starting rates of pay for mechanics are under the market rates. This creates recruiting problems. Metro recently studied pay rates for all jobs and established a starting rate for mechanics of \$14.62. The MNPS starting point is \$10.53.
- The organization of the DOT, pertaining to bus maintenance is stacked, or vertical. All functions report through the Transportation Manager.
- TCI agrees with the MGT report in terms of fleet size, purchase of equipment, and spare ratios.
- The MGT report pointed out that the maintenance organization did not have any records or processes in place to measure the effectiveness of their preventative maintenance (PM) process and their oil change policy. TCI agrees and further suggests that routine oil analysis of the buses begin immediately.

- TCI's visit coincided with the opening of school, allowing us to observe the maintenance shop at one of the most critical times of the year. The planning and control of preparing buses for operation was chaotic. As of the day before the start of school, 48 buses were not suitable for operation. TCI, in conjunction with the shop foreman, inspected several of the buses in the fleet. These buses had been inspected by the shop and were supposed to be ready for service. A number of them were sent back to the shop for additional work. On the first day of school, 18 buses had broken down by 8:00 a.m., and a total of 21 had broken down by the end of the morning runs.
- MNPS fleet management and maintenance uses the Student Transportation Information System (STIMS) to process its work orders. The system has been installed for less than two years. Good progress has been made with the installation, although work remains to be done, especially in the inventory and reporting areas. While we understand the reasons for selection of this system, TCI's observation is that the system has considerable limitations.
- There is a need to enhance written policies and procedures in the maintenance operation. This is vital to improving maintenance consistency and quality.
- Management reporting of maintenance measures is not in place.
- While some targets have been set for improvement, TCI was unable to determine the processes that had been put in place to reach the targets.
- TCI normally calculates cost per vehicle and vehicles per mechanic to measure efficiency. We will speak to those measures in detail, but do not recommend additional cuts in staff at this time. The near term emphasis needs to be placed on improving maintenance quality and the atmosphere within the shop. Once these problems are addressed, MNPS should work toward achieving a mechanic to bus ratio of 25 to one, reducing the number of mechanics from 28 to 22. This assumes the current fleet size and continued improvement in shop efficiency.
- The DOT recently salvaged about \$250,000 of slow moving or obsolete parts. Based on our observations, this was appropriate. The parts inventory remains at \$250,000. This is high relative to the annual parts purchases of \$455,000. Use of the STIMS system as an inventory replenishment system should help to reduce inventory.
- This is a maintenance program that is highly ineffective. Specific targets should be put in place. If improvement is not observed on a clear and consistent basis, full privatization or partial privatization of the maintenance operation should be considered.

With regard to other fleet operations:

- MNPS maintains a fleet of 165 maintenance, operations and security vehicles. The Plant Maintenance group has 85 units maintained by one mechanic, while the Operations group reports 80 vehicles maintained by three mechanics who also maintain grounds equipment.
- Both organizations would like to use ten years and 100,000 miles as replacement guidelines. Of these 165 vehicles, 38 have mileage over 100,000.
- These vehicles are not maintained in a consistent or organized fashion. Some repairs are outsourced; some are sent to the DOT; some are deferred.

Summary of Financial Implications :

Recommended potential annual savings:

- Reduction in parts inventory - savings in carrying costs\$8,250
- Potential reduction in mechanics based on current fleet size\$240,000

Recommended additional annual cost:

- Addition of a Fleet Manager\$15,000

It should be noted that the above savings could be offset by increased mechanic starting salaries, discussed further below. Additionally, the ultimate reduction in fleet size is currently unknown. MNPS recently found it necessary to add 24 drivers, is considering changing bus driver practices, and is going to implement computerized bus routing in the near future. For the current fleet size, TCI recommends reducing the number of mechanics by 2 per year, beginning in 2002-03, over a three-year period. Should changes in practices or routing efficiencies make it necessary to further reduce the number of mechanics in order to keep the vehicle to mechanic ratio at 25 to 1, TCI would recommend accelerating the reduction in the number of mechanics beginning in the 2003-04 fiscal year.

1.1 Overview of Metropolitan Nashville Public Schools Fleet Management and Maintenance

As previously mentioned, the MNPS fleet management and maintenance group is located inside the DOT headquarters. While the office area is limited and temporary buildings have been erected to handle overflow, the maintenance area is well suited for the task.

The space used for repair operations consists of 72,000 square feet. The area includes 16 bays and 16 overhead doors, as well as parts, tire storage, and 2 small workshops.

MNPS fleet management and maintenance operates five days per week. Maintenance operations commence at 5:00 a.m. and end at 5:30 p.m. These hours are designed to support normal bus operations.

The bus inventory totals 539. The median age for vehicles is 1997. The equipment inventory will be discussed further in **Section 1.7, Fleet Assets and Replacement**.

The equipment maintenance shop is currently staffed with 28 mechanics and two working foremen.

1.2 Management Issues/Policies and Procedures

TCI finds that MNPS fleet management and maintenance struggles to keep their equipment in working order. In addition, communications inside the organization and working relationships are strained.

DOT management has responded positively to most of the MGT findings. Immediate changes were made in reducing bus purchases and in reducing the size of the maintenance staff. In addition, a recommendation has been made to MNPS management on the purchase of routing software. While the Director of Transportation has addressed these and many other problems in the two years that he has been on board, there is still much work to be done.

As mentioned above, the organization of the DOT is stacked or vertical. All functions report through the Transportation Manager. While the Transportation Manager has the experience to supervise the maintenance area, he has other, broad responsibilities. The situation is further compounded by the fact that the maintenance area has so many critical problems. The Director is often called upon to assist in the management of the area.

The Director of Transportation is aware of the problem and has requested approval to appoint a Fleet Manager to directly manage the maintenance function. TCI supports the recommendation.

With the challenges ahead for the maintenance operation, one manager should be focusing solely on the maintenance shop.

Certain key components of a solid organization are not in place. These components fall in the areas of employee relations, maintenance quality, inventory management procedures, and reporting. These changes and opportunities are detailed below:

- The relationship between the Director and the Transportation Manager on one hand and the foreman and mechanics on the other is strained.
- Many Human Resources issues exist in the Department of Transportation.
- The quality of repairs and PM's is not acceptable. The fleet contains too many unreliable buses. Unsafe conditions that required buses to be pulled out of service and repaired immediately were uncovered.
- Inventory management needs improvement. This will be addressed in **Section 1.5, Inventory Management.**
- Fleet policy and procedures are not clearly and consistently documented.
- Management reports are not fully developed or deployed.

Below are some recommendations that we have relative to management issues. Some of these issues will also be discussed later in the report.

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| (1) Current Situation: | Absence of Repair Quality |
| Finding: | There is a lack of consistent, high quality preventative maintenance and repair work. |
| Recommendation: | Hire a Fleet Manager. Free up the Shop Foreman to inspect vehicles after preventative maintenance and repairs. Develop better checklists for repairs and PM's. Place the best mechanics on the inspection team, and use smaller teams to ensure accountability. Request that state inspectors revisit the shop to complete inspections. Conduct small, quick seminars |

on critical areas. Use overtime and outsourcing to reduce the repair backlog. Identify the critical components and train all employees to be sensitive to battery corrosion, brake and steering reliability, tire wear and mirror functionality. If shop expertise for a particular job is questionable, outsource the repair.

Cost Implications:

Resources exist in the organization to address this problem. The annual cost of a fleet manager would be \$60,000. This would be partially offset by the elimination of a lead mechanic or assistant foreman position. The incremental cost would \$15,000.

(2) Current Situation:

Employee Morale

Finding:

There is a lack of understanding, as well as considerable tension, between management and the shop.

Recommendation:

Eliminate the stacked reporting relationship. Hire a Fleet Manager who can spend full time on the maintenance situation. In the short run, have the shop report directly to the Director or relieve the Transportation Manager of other responsibilities. Establish weekly small group meetings. Focus on a few critical areas for improvement, starting with safety and repair quality.

Cost Implications:

Better management will actually reduce costs and pay for itself over time. Road calls and downtime will be reduced. Less labor will be required over all.

(3) Current Situation:

Multiple Human Resources Issues

Finding:

There is significant tension in the organization, and Management believes that they need more support for these issues.

Recommendation:

Station a Human Resources person in the DOT facility to be more readily available to provide HR support to employees and management.

Cost Implications:

None. The work is already performed within the MNPS. Location is the issue.

- (4) **Current Situation:** **Absence of Written Procedures**
- Finding:** There is a lack of consistent and complete written policies and procedures.
- Recommendation:** Identify the critical areas where procedures are required, starting with PM's and inspections. MNPS has contracted with TCI to work with the shop to improve their checklists and processes. Obtain administrative support to help articulate and then write other procedures with input from key staff. Develop a simple book of procedures so that the information is kept in one place and available for all employees.
- Cost Implications:** MNPS has contracted with TCI to provide supervision of and training for the maintenance effort. TCI will begin documenting procedures, and this will be included in the cost of the TCI support contract.
- (5) **Current Situation:** **Lack of Maintenance Reporting**
- Finding:** Little MNPS fleet management and maintenance reporting exists.
- Recommendation:** Using the metrics below, management should determine the critical areas for measurement. Support should be given to MNPS maintenance in developing reports and collecting information. The expectations and reports should be shared across the board, including users, staff and appropriate members of MNPS management. Some key measures captured by larger fleet operations include:
- Downtime:**
The number of vehicles **out of service** at a given point in time divided by the number of vehicles in the fleet, expressed in percentage format. A norm for MNPS would be 6-8%.
- Utilization (labor):**
The amount of direct, billable time recorded by service employees compared to the total amount of

time available for work expressed in a percentage format. A reasonable target is 75%.

Turn-around Time:

The elapsed time beginning when a vehicle (or equivalent) is delivered to a maintenance facility for repairs or servicing and ending when the repairs or servicing is completed and the user is notified that repairs are completed (typically expressed as <8 hours; > 24 hours; 24 to 48 hours; and > 48 hours). TCI expects to see 70% of the repairs complete within 2 days.

Repeats/Come-backs:

Instances where repairs to vehicles, machinery or equipment were not made in a satisfactory manner, necessitating a second request for repairs for a similar labor code.

Preventative Maintenance (PM) vs. Corrective Maintenance:

The ratio of job orders for vehicles, machinery or equipment that are written for scheduled maintenance as opposed to job orders that are written for corrective or unscheduled repairs, divided by the total repairs and expressed as a percentage. A percent in excess of 50% indicates that the PM program is effective and reducing unexpected and untimely breakdowns.

Preventative Maintenance Compliance:

The percentage of on-time arrivals for scheduled preventative maintenance (PM) expressed as within 3 days or 500 miles of the scheduled maintenance date or mileage interval.

Cost Per Piece of Equipment:

Annual department costs divided by the number of vehicles. TCI estimates a target of \$3,200 is appropriate for this fleet.

Vehicles Per Mechanic:

The number of mechanics divided by the total equipment. The MGT report suggests a norm of 25 buses per mechanic. TCI supports this.

In the case of the MNPS maintenance effort, we would suggest starting with the measurements that are easy to obtain and understand. Our suggestions would include cost per equipment item, PM compliance, and a status report that shows equipment out of service and turnaround time. We support the MGT recommendation that targets be set and monitored for miles per road call. According to the MGT report, the MNPS is averaging 908 miles between road calls. This equates to a road call every 11 days for each bus. While TCI did not verify these numbers, this is in our opinion an extremely high level of road calls.

Results should be shared with all personnel.

Cost Implications: The staff and expertise is in place to provide this information. The data can be obtained from the STIMS system. Better information means better decisions, and lower costs.

1.3 Maintenance Metrics

As mentioned in the previous section, a key element in responsive fleet management and maintenance is the use of management reports and metrics to measure performance. Over the years, TCI has developed certain metrics and standards that are useful benchmarks. It is useful to track these measures on a historical basis.

TCI examined the work orders contained in the STIMS system for the months of March through May 2001. We obtained the following results.

In terms of **downtime**, the shop averaged 35 work orders per day. If all buses were returned to service the same day, the **downtime** percent would be 7.7% of buses. TCI would expect results in the 6-8% range. The DOT should develop some routine for calculating buses not available for service and set a target for improvement.

TCI's calculation for **utilization** of mechanics resulted in 25 percent. Our norm for this is 75%. As previously mentioned, the shop averages 35 work orders per day. There are 28 individuals performing mechanics duties on a day-to-day basis.

Each mechanic is working on less than two work orders per day. Both these measures indicate inefficient use of labor.

The MNPS maintenance group returns 88% of buses to service within a two-day period. However, this positive measure is negated by the poor mechanical quality of vehicles. The table below shows those results:

**Table 1: MNPS Fleet Management
Shop Turnaround Summary
March – May 2001**

Category	Number of Work Orders	Percent
Less Than Two Days	1,910	88
2-4 Days	105	5
Over 4 Days	150	7
Total	2,165	100

TCI did not find precise data to allow us to measure **repeat service calls**. We did review one type of repair, batteries or no starts, and found a number of cases where the same bus had multiple failures.

Our review of **preventative versus corrective maintenance** showed that the MNPS shop spent 33% of its time on PM's. TCI would expect to see at least 50% of maintenance effort directed towards the preventative side.

Section 1.6, Financial Information lists the costs for the maintenance function. The **cost per vehicle** calculation is shown in the table 2 on the following page.

**Table 2: MNPS Fleet Management
Cost Per Vehicle Calculations**

Budgeted Fleet Costs less Fuel	Number of Vehicles	Cost Per Unit
\$2,017,000	539	\$3,740

In our opinion this cost is high. The fleet is relatively standard and mileage is predictable. School vacations present an opportunity to ensure all buses are inspected and serviced on a consistent basis. TCI would set a long-term goal of \$3,200. This goal should be attained as the maintenance operation is better supervised, as parts and tire purchases are improved, and as labor utilization is improved.

The MGT report suggested a fleet size target of 493. This is based on a 10% spare ratio. The spare ratio is added to the number of buses needed daily. The table below shows the potential savings attainable in the long run, assuming no changes in student population and programs.

**Table 3: MNPS Fleet Management
Estimated Cost Per Vehicle**

Estimated Fleet Costs less Fuel	Target Number of Vehicles	Target Cost per Vehicle
\$1,577,600	493	\$3,200

The MNPS Equipment inventory contains 539 buses. This inventory is further defined in **Section 1.7, Fleet Assets and Replacement**. The shop utilizes 28 individuals who perform mechanical functions daily. This calculates a **bus to mechanic** ratio of 19 to 1. The recently completed performance audit of the MNPS recommended a goal of 25 buses per mechanic, which would ultimately reduce the total number of mechanics from the current level of 28 to 22. Once MNPS implements the recommendations of this report, we expect to see an improvement in this ratio. We suggest that the first order of emphasis be the immediate improvement of the PM and repair processes. The next step would be improving the cost situation.

TCI estimates that the remainder of FY 2001 – 02 will be spent improving the PM and repair processes. During the following fiscal years, DOT management should develop targets that gradually improve the vehicle to mechanic ratios over the next three years by beginning to reduce the number of mechanics by 2 per year beginning in FY 2002 – 03.

Another important factor in future staffing is any change in the fleet size. For example, subsequent to the TCI visit, the Board of Education approved a pilot program to add 24 drivers, which will impact the ability to reduce the fleet size to levels recommended by MGT. This will increase total cost and the required number of mechanics.

The Board of Education also has approved the purchase of a computerized routing system. Once in place, this system should contribute to a reduction in the number of buses.

Regardless, TCI supports the recommendation of the MGT performance audit that stipulated a 10% spare ratio and an eventual ratio of 25 vehicles per mechanic.

These are important measures for the DOT to track and to target.

TCI agrees with the MGT report that road calls are an important metric. During the months of March, April, and May, the MNPS fleet required 229 road calls. The road calls in turn created 65 wrecker calls. The incidents are very expensive. From a service standpoint, road calls often represent children late for school or returning home later than scheduled.

1.4 Information System

Timely and accurate management and maintenance information is an essential ingredient in successful fleet management and maintenance. Today's best fleet management and maintenance information packages provide barcode data entry on a real time basis and allow quick access to both current and historical data that is needed by technicians and management for proper decision-making.

MNPS is using the STIMS software to monitor maintenance and inventory. This system has some significant weaknesses. Here are some of them:

- User documentation is poor.
- The standard reports are not useful.
- The system has capacity limitations that require frequent archiving.
- The software utilizes FoxPro. This is a database language that is becoming obsolete.

While the STIMS software has the above limitations, we support management's implementation of this system and do not recommend replacement at this time. The system is functional and does meet the information needed to operate on a daily basis.

As TCI builds the requirements for a Metro-wide system solution, MNPS needs should be considered for future system conversion.

(6) Current Situation:	STIMS Improvements
Finding:	While the system is adequate for today's operation, it has significant drawbacks.
Recommendation:	Utilize STIMS for the short term. Incorporate MNPS needs into the overall Metro system needs, and convert STIMS at an appropriate future time.
Cost Implications:	None for MNPS.

1.5 Inventory Management

The parts area in MNPS fleet maintenance is located adjacent to the garage area. Parts are stored on two levels. The space, lighting, and shelving are appropriate for this parts function.

The MNPS maintenance group recently reviewed the inventory and salvaged \$250,000 in parts. These were mostly held over from previous management. In our judgment, some further culling could take place. \$250,000 of inventory remains. The current parts budget calls for spending of \$455,000. The inventory turnover in this case would be 1.75. TCI would expect turnover to be at least five times with this fleet.

DOT management expects to make additional reductions in inventory, and has set a target of \$100,000. Given the consistent fleet type and rapid availability of many parts, this target seems reasonable.

The STIMS software has the capability to utilize reorder points and other inventory tools to help reduce inventory.

MNPS utilizes Metro contracts to good advantage. Other purchases are obtained through a verbal quote basis. The current operation requires three quotes, regardless of amount.

TCI reviewed the physical inventory process with parts personnel. They pointed out that there is no formal cut off for inventory. This creates an inaccurate count.

Fuel is purchased through the Metro contract. The annual fuel purchases approach \$1,000,000. Fuel is distributed through a network of MNPS tanks and also purchased through a chain of local gas stations.

MNPS augments their in-house fuel program with external or commercial purchases authorized through the Fleet One program. Currently 55% – 60% of fuel usage is pumped from sites at:

- Bellevue Middle School (West)
- Ewing Park (North)
- Woodycrest Terminal (Central)

MNPS issues drivers the Fleet One card for their convenience and to minimize long drives to MNPS fueling sites. MNPS currently pays for Fleet One purchases cost plus basis with an administrative charge of \$.109 per a gallon. The cost is based on the daily spot purchase price as reported by OPIS. Taxes are excluded from the calculation.

During May 2001 gasoline purchased for delivery to MNPS tanks averaged \$.95 per gallon. Fuel purchased through the Fleet One program averaged \$1.07 per gallon. TCI will continue to review this program as part of its support contract.

- (7) **Current Situation:** **Inventory Level Too High**
- Finding:** The inventory is turning less than twice per year.
- Recommendation:** Provide the necessary training and resources to the parts staff to implement inventory control techniques, notably re-order points. Set gradual reduction targets and track them. Salvage the remaining obsolete parts.
- Cost Implications:** Most of the work can be done by using existing staff. Support by a contract employee with inventory experience would be helpful. Overtime may be needed. These changes could probably be made for less than \$5,000, with 200 hours of overtime at \$20 per hour. Inventory carrying cost would be reduced by at least \$8,000 in the first year. If inventory were turning at five times per year, the inventory dollar value would be \$85,000, a reduction of \$165,000. Using a cost of capital of 5%, this would provide a savings of \$8,250 per year.
- (8) **Current Situation:** **Three Quote Requirement**
- Finding:** Parts personnel are obtaining three quotes for all orders not on contract.
- Recommendation:** Consider waiving the 3-quote requirement for orders under \$1,000, which is the amount established in Metro's procurement code.
- Cost Implications:** Although not readily quantifiable, this should reduce labor costs by more than any increase in parts costs.
- (9) **Current Situation:** **No Formal Cut Off for Physical Inventory**
- Finding:** It is difficult to get accurate counts when counting is being done during normal operations.

Recommendation: Shut down receipts and requisitions on Friday afternoon. Issue any parts in advance for work orders in process. Have several count teams scheduled to count Friday afternoon. Reconcile any major count discrepancies Saturday morning.

Cost Implications : Some minor overtime costs.

1.6 Financial Information

The Department of Transportation maintenance operation has a budget of \$2,017,000. This budget does not include \$1,121,000 budgeted for fuel. These numbers does not include any costs for the Operations and Plant Maintenance vehicles, which are not available.

The annual budget can be separated into major components as follows:

- Labor Related Expenditures\$1,400,000
- Shop Tools17,000
- Outside Repair70,000
- Automotive Parts.....455,000
- Tires75,000

1.7 Fleet Assets and Replacement

TCI reviewed the equipment inventory. Table three shows the age of the fleet:

Table 3: MNPS Equipment Aging

	Equipment Units	Median Age
School Buses	539	1997
Light and Maintenance Vehicles	165	1995

The median age for buses was 1997. Of the 539 buses, 20 have reached retirement guidelines and are due for salvage within one year. Based on the MGT report and TCI’s recommendations, the fleet total should be dropping over the next several years. This decline in numbers will be caused by better management of spare buses and drivers, better maintenance, and the results from a routing system. Buses should continue to be replaced according to state guidelines (12-15 years).

This assumes that requirements do not change. Growth or reduction in programs or students will influence bus totals.

Current operating practices, such as bus location and scheduling for absenteeism increase bus requirements and reduce bus utilization. If drivers are absent, their assigned bus is idle. A review of these practices should precede the installation of the new routing system.

MNPS maintains a large fleet of maintenance, operations and security vehicles. Fleet records are not maintained centrally, and information is not current. TCI did visit the maintenance and operations facilities. The Plant Maintenance group has 85 units, while Operations reports 80. Both organizations would like to use ten years and 100,000 miles as replenishment guidelines. Of these 165 vehicles, 38 have mileage over 100,000.

In addition to being relatively old and high mileage, this light vehicle fleet is maintained by a variety of sources. The Operations fleet is maintained by the general purpose mechanics that maintain the grounds equipment. They also utilize outside vendors for some functions. The Plant Maintenance group recently hired a mechanic to service their vehicles. The vehicles are serviced in an old school building. They also tend to outsource any significant repair. The priorities and core competencies of the Operations and Plant Maintenance groups do not include vehicle maintenance. Key ingredients to a good vehicle maintenance program (systems, tools, specialization) do not exist.

This situation creates many problems. Personnel are exposed to unsafe operating conditions. Vehicles are often called out on emergencies during the night. An unreliable vehicle can create unsafe conditions for employees. In addition, vehicles are being repaired when they are well past their expected life. Recently, the engine in a 1988 truck was replaced. The cost of the new motor was greater than the value of the vehicle.

Both organizations have very high vehicle to employee ratios. This may be caused by the need for spare vehicles, since the fleet is not reliable.

(10) Current Situation:

Bus Utilization

Finding:

Current practices for bus staging and storage, and for replacement of absentee drivers increase bus requirements.

- Recommendation:** Consider alternative methods for bus staging. Stage all spare buses on MNPS sites to improve utilization.
- Cost Implications:** Unknown until study is done. Should result in some reductions in the fleet.
- (11) **Current Situation:** **Maintenance and Operations Fleet**
- Finding:** These two fleets have old and unreliable vehicles. Maintenance is unevenly performed.
- Recommendation:** Consideration should be given to transitioning maintenance responsibilities to the General Services Motor Pool for the light fleet, to Public Works for heavy equipment, and to Parks for grounds maintenance equipment as the recommendations related to the Metro departments are implemented and those operations are in a position to absorb MNPS non-bus fleets.
- Cost Implications:** Because costs were not readily available, savings are unknown at this time but will be determined as part of TCI's ongoing support contract. Transferring maintenance responsibilities to Metro is expected to result in enhanced maintenance of the fleet at reduced cost.
- (12) **Current Situation:** **Need for Vehicle Utilization Study**
- Finding:** Both Plant Maintenance and Operations have high ratios of vehicles to employees. Plant maintenance is decentralizing some functions to high school locations.
- Recommendation:** Do a vehicle utilization study on both departments and develop an ongoing capital replacement plan based on the number of vehicles needed. For the current year, only replace the vehicles that are over 10 years and 100,000 miles and that are actually in use, but do not replace more than 25% of the vehicles in any one operation.
- Cost Implications:** Although not readily quantifiable, a reduction in vehicles would provide savings.

1.8 Maintenance Operations

Maintenance Management

Work scheduling, inspection of completed tasks, planning, and productivity measurement and improvements are not being addressed. Supervision, **especially student transport supervision**, must remain focused on maintenance quality and detail to provide safe, reliable, economical and cost competitive service to the community.

Maintenance quality, reliability, and student safety are **compromised** as a result of the ineffectiveness of the maintenance operation. For example:

- Supervisors report that “on yard” inspections and inspections of completed mechanical repairs had **never** occurred within the past twenty years.
- The Transportation Department is not practicing basic accountability steps or establishing and enforcing reasonable quality and productivity standards.
- Management reports a lack of support in disciplining or terminating mechanics with long histories of qualification or performance problems.
- The starting rates of pay for mechanics are under the market rates. This creates recruiting and retention problems. For example, the starting rate for a mechanic in the MNPS system is \$10.53. The last time a job opening was advertised no viable applications were received. Based on our observations the going rate for a mechanic in Nashville approaches \$15 per hour. It takes several years of service for a mechanic to reach an adequate level of pay.

Photographs are attached to document some of our observations.

Preventative Maintenance

Management of comprehensive and well scheduled preventative maintenance is the major reason any fleet would absorb the cost and effort of maintaining a garage and mechanic staff. Most other fleet related maintenance and repair could be performed cost effectively by outside vendors.

Preventative maintenance is usually best performed by in house personnel **if** ownership, pride of workmanship, accountability and a strong sense of responsibility exists. We did not find the necessary ingredients in place required to

develop, cultivate, and maintain an acceptable level of preventative maintenance. This observation is validated by the condition of the fleet, as described below. A major philosophical shift and redeployment of effort will be required to successfully implement applicable preventative maintenance processes into this operation. Formats currently exist for 10,000, 20,000, and 40,000-mile inspections. A separate 20-day schedule also exists. Our review revealed that the inspection procedures were not adhered to. Supervision indicated that trimming inspection times down to less than 20-30 minutes per bus was **positive**. An adequate inspection and PM would take 90 minutes, using two people. Drivers have become accustomed to cursory inspections and accepting frequent no-starts, break downs, and generally slow response times to reported defects. The current inspection routine and schedule does not reduce breakdowns. “Team” approaches to the inspection process has reduced any possible accountability or follow up, as it becomes difficult to identify which team member failed to perform discrete tasks.

Documentation of bus condition is not consistent with actual conditions. We discovered examples where one-mile old data differed greatly from the actual bus status. For example, when TCI conducted weekend inspections of 55 buses, the tire wear measures were often different from the most recent PM records.

The preventative maintenance inspection process should be rewritten and reintroduced using the best technicians with direct supervision. It must become the “backbone” of the fleet maintenance operation. TCI is currently working with MNPS to improve this process.

Fleet Condition

A standard routine of our review includes auditing randomly selected buses for safety, mechanical condition, reliability, and appearance. Ten of the twelve selected buses required dispatch back to the garage to correct safety and reliability concerns. School was scheduled to start within the week of our audit. The fact that ten of twelve random buses were **not ready for service**, and that supervision was **surprised** at the serious nature of the identified defects, defines the current unacceptable fleet condition.

Workmanship and repair quality for many recent repairs was found unacceptable. Several shoddy repairs were found that would have resulted in immediate breakdowns and more expensive repair with subsequent damage.

Several newly assigned buses required jump-starting prior to leaving the lot before the first day of school. When the fleet maintenance staff began to ready the fleet for the new school year, 95 buses on the lot were found to have dead batteries. Management and staff felt that this was an unusually high number. They observed that many of the buses were parked with interior lights or radios left on. This shows a lack of discipline in preparing buses for storage, carelessness, or a willful disregard for MNPS property.

Excessive road call and on yard breakdown frequency also indicates less than acceptable maintenance levels. The August 13 “trial run” and the first school day commenced with many simple and preventable but costly delays causing breakdowns. Eighteen buses broke down during the trial run, and twenty-one service calls came in on the first morning of school.

The condition of the fleet resulted in TCI inspecting a greater part of the fleet. A weekend inspection of 55 buses was done. **TCI’s inspection identified 413 defects, of which 177 were safety related and required that several buses undergo immediate repairs.** DOT personnel inspected additional buses with similar results. Many defects were very serious in nature. In addition to the lack of competency of the garage in addressing these issues, it is equally **distressing** that the bus operators were not uncovering or reporting these defects during their daily checklist reviews.

Tire Program

Effective tire program management is essential to fleet safety, cost effectiveness, and readiness. We identified serious problems with the current tire procedures that require prompt attention and follow up.

Removed tires (227) are retained on the property too long and collect rainwater that provides mosquito-breeding areas. Scrap tires provide easily observed evidence of operating tires past acceptable tread depths; tires do not become “slick” after removal. Removed tires should be discarded off site or forwarded to retread shops within five days of removal.

New bus rear tires are removed and replaced with retreads and saved for steering axle installation across the fleet. We advise that this practice distorts vehicle operating cost data and creates potential losses, as the new tires are not properly accounted for. Buses should be specified with appropriate tire treads and be placed in service as delivered.

81 non-mounted tires were piled outside the tire repair bay; their inner-liners exposed to damaging rain and ultra-violet light. An additional 73 tires were found in the tire bay. Maintaining a tire inventory of this level consumes capital and encourages obsolescence.

We were particularly troubled to discover many tires under-inflated or with insufficient tread on in-service buses. For example, the above-mentioned weekend inspection detected over 50 unsafe tires. There is **no** rational explanation for finding dozens of under-inflated and insufficiently treaded tires on in-service buses just days prior to school start. Many of these buses had recently been maintained and inspected. Supervision was again **surprised** at the fleets' tire condition.

Each mechanic and supervisor should be scheduled for basic tire maintenance and repair classes.

Drivers and their supervisors should also receive basic training in tire defect recognition and reporting procedures.

Replacement Parts

Locally purchased replacement batteries do not appear to provide acceptable life expectations and also appear to cause some of the corrosion found on many bus battery terminals. Records indicate that original batteries provide three years or more service while replacements last only slightly more than one year. Some buses receive two or three batteries per year.

This situation had not been researched, but supervision already knew that the current batteries were not of original equipment quality. When TCI inquired as to why they would continue using this product, we were informed that "low bid" suppliers were selected in most agreements.

The garage mechanics "rebuild" many components in house. These parts are not warrantied, costs are questionable, and locally rebuilt parts will never include current manufacturers' updates and improvements. Local mechanic labor would be much better utilized with a strong preventative maintenance program.

Other Comments

Management and supervision have elected to install an after market diesel fuel apparatus on many of the buses at a parts and labor cost approaching \$800 per bus, an amount that would require significant fuel savings to recover the

investment. Supervision focused on the cost savings of this device, but failed to consider very important aspects and associated liabilities of **tampering with or modifying** delicately tuned fuel and emission systems.

Much effort and capital expense has improved the maintenance garage interior. Walls have been painted and new overhead doors have been installed, for example. This effort was well received by the staff. The previous management had allowed the facility to become poorly maintained.

A similar effort is required with the garage exterior and grounds. Old drums, engines, trash, and other junk should be discarded. The closed truck wash area in particular has become unsightly and dangerous with debris and junk. The perimeter fence line should be trimmed and maintained for appearance and security purposes.

In addition to the environmental and safety issues outside the facility, several safety violations present in the shop area require continuing attention. The service pits should always be chained off to prevent someone falling into them when not covered by a bus or other vehicle. The shop bench grinder should be adjusted and fitted with new shielding, and buses should not be elevated on home made ramps.

The MGT report stressed the need for emphasis on training and certification of the staff. TCI agrees that this should be done.

In addition, three mechanics are performing jobs that are administrative or non-mechanical in nature. The administrative jobs being performed are service writer, budget and reporting, and fueling operations.

(13)	Current Situation:	Personnel In Mechanic Pay Grades Performing Other Jobs
	Finding:	Several staff members are paid as mechanics, but are performing non-mechanic functions.
	Recommendation:	Reclassify these employees into appropriate job titles.
	Cost Implications:	None

- (14) **Current Situation:** **Marshalling and Exterior Areas Not Tidy**
- Finding:** The old wash area, the outside tire storage area, and other outside areas contain junk and scrapped items.
- Recommendation:** Clean up the outside areas.
- Cost Implications:** None. This may actually provide some revenue from scrap metal dealers.
- (15) **Current Situation:** **PM Process Ineffective**
- Finding:** The PM process presently in use is not ensuring that reliable and safe buses are in service.
- Recommendation:** Totally revamp and reemphasize this process. Assign the best mechanics and team leaders to inspections. Train all mechanics, and monitor performance. Monitor inspections for quality, completion, and correct record keeping.
- Cost Implications:** The longer-term solution is to hire a qualified fleet manager, which is addressed above.
- (16) **Current Situation:** **Operators Not Aware of Bus Checklists and Safety Ramifications**
- Finding:** Bus operators are not aware of the need to check their buses on a daily basis, and to return buses for correction.
- Recommendation:** Work with operations supervisors to train operators. Have supervisors spend time inspecting buses with the drivers.
- Cost Implications:** None. The bus drivers are paid for 8 hours per day and should have time to perform the checklist in that time period.

- (17) **Current Situation:** **Bus Garage Not Performing Efficiently**
- Finding:** The bus garage is not effective in servicing buses. In addition, morale is poor.
- Recommendation:** Assign extra management resources to address this problem. Consider hiring a Fleet Manager or using outside support. If this situation cannot be improved, consider outsourcing the maintenance function.
- Cost Implications:** The expected savings through the reduction of staff and material purchases will more than recover the cost of a fleet manager.
- (18) **Current Situation:** **Inferior Parts Being Purchased, Rebuilt and Used**
- Finding:** Some parts are being purchased on a low bid basis. Others are being rebuilt with the MNPS garage.
- Recommendation:** The emphasis should be on high quality, not cost. OEM (Original Equipment Manufacturer) quality and equivalent parts should be bought. The garage should eliminate rebuilding.
- Cost Implications:** Although not readily quantifiable, in the long run parts costs will be reduced. Parts life will be significantly improved.
- (19) **Current Situation:** **MNPS Has Purchased After Market Devices to Enhance Engine Performance**
- Finding:** MNPS has purchased after market devices to enhance engine performance. No contact was made of the engine manufacturer as to the advisability of the device, or the impact on warranty.
- Recommendation:** Do not continue to install these devices until more data is obtained.
- Cost Implications:** Unknown at present.

- (20) **Current Situation:** **Safety Violations Present in the Garage**
- Finding:** TCI observed several safety violations within the MNPS garage.
- Recommendation:** Management should conduct safety inspections with safety resources available within Metro, then correct all identified safety hazards.
- Cost Indications:** The items observed by TCI could be solved by the use of existing labor and less than \$2,000 in proper safety equipment and guards.
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- (21) **Current Situation:** **Tire Program**
- Finding:** MNPS carries a tire inventory that is too large. The existing tire program is not performing well.
- Recommendation:** Consider contracting with an outside service to provide in house and road service, perhaps in conjunction with other Metro departments.
- Cost Indications:** Although not readily quantifiable, meaningful savings should result.
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- (22) **Current Situation:** **Mechanic Pay**
- Finding:** MNPS mechanic pay looks low compared to market, other Metro mechanics and the Nashville market.
- Recommendation:** Review mechanics starting pay rate and growth potential to ensure competitive pay.
- Cost Indications:** Unclear at this point.