Commission Briefing Paper 3H-01
Baseline Transit Needs Assessment

Prepared by: Section 1909 Staff with assistance from AECOM Consult.
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Introduction

This paper is part of a series of briefing papers to be prepared for the National Surface Transportation Policy and Revenue Study Commission authorized in Section 1909 of SAFETEA-LU. The papers are intended to synthesize the state-of-the-practice consensus on the issues that are relevant to the Commission's charge outlined in Section 1909, and will serve as background material in developing the analyses to be presented in the final report of the Commission.

Section 1909 requires the final report of the Commission to include an assessment of future needs over 15-, 30-, and 50-year time horizons. The papers in Module III are intended to facilitate this effort by developing a baseline needs assessment, which can then serve as a basis for subsequent supplementary analysis and scenario development. This paper provides a baseline needs assessment for the Nations public transit systems, **for 15-, 30-, and 50-year time horizons**. Needs assessments for other modes are to be covered under task area III-G (highways); III-I (freight and passenger rail); and III-J (other components, including intercity bus; inland and coastal waterways; and intermodal transfer facilities).

Key findings on transit finance and investment requirements from the 2006 Conditions and Performance (C&P) report are covered in briefing papers 3B-01, 3D-01, and 3E-01. The relationship between this baseline analysis and the C&P investment analysis is described in greater detail below.

Background and Key Findings

- The baseline transit needs estimates presented in this paper are based on the Improve Condition and Performance scenario as presented in the biennial Status of the Nation's Highways, Bridges and Transit, Conditions and Performance Report to Congress (C&P Report) as this scenario most closely parallels the baseline highway needs scenario presented in briefing paper 3G-01. The Improve Condition and Performance scenario is the higher needs scenario presented in the C&P Report and includes needs for urbanized areas, rural areas and for special service vehicles.
- Total transit baseline needs on a cumulative basis in constant 2005 dollars are estimated to be $1.1 trillion through 2020, $2.4 trillion through 2035 and $4.4 trillion through 2055. These estimates are the sum of the constant dollar estimates for each year.
- This baseline transit needs estimate is the first step towards developing the needs analysis component of the Commission work. This baseline can be modified to address changes in forecasts of growth in travel demand for transit, life cycle cost assumptions and the timing of rehabilitation and replacement activities. This baseline assumes transit travel will grow at an average annual rate of 1.57 percent over the 15, 30 and 50-year projection periods. This is the same baseline used in the 2006 C&P Report and is based on travel projections from 92 Metropolitan Planning Organizations (MPOs) collected for this report.

Staff Comments

The paper has been prepared by Commission staff with assistance from AECOM Consult. AECOM Consult contributed sections comparing FTA estimates for the 2006 Conditions and Performance Report with needs estimates from a recently completed Transportation Cooperative Research Program (TCRP) report. AECOM also compared TERM estimates with investment estimates in published capital improvement plans (CIPs) for large transit agencies.

Approach and Key Assumptions

The baseline needs in this report are based on the Improve Conditions and Performance scenario in the C&P report, the scenario most comparable to the baseline scenario presented in paper 3G-01 for highways.

All the investments in the baseline needs estimate have passed a benefit-cost test. The transportation user benefits considered by TERM are travel-time savings, reductions in highway congestion and delay, and reductions in automobile costs; the social benefits considered are reduced air and noise emissions, and reduced roadway wear and transportation system administration; the transit agency benefits considered are reductions in operating and maintenance costs. TERM does not consider mobility benefits, i.e., the value of transit to riders with limited or no other transportation alternatives, which are difficult to quantify; this omission gives a downward bias to TERM's investment estimates. TERM's investment needs estimates exclude continued investment in many existing demand response systems and several historic light rail systems because it does not fully capture the benefits associated with these systems. The estimated needs for these demand response and historic light rail systems were they included, would represent a small part of total transit needs.

The baseline needs estimates in this report have been determined using a discount rate of 4 percent, as compared with the 7 percent discount rate used in the C&P Report in accordance OMB guidelines for Federal infrastructure analyses. The 4 percent rate is more in line with recent interest rates (which reflect the opportunity cost of making additional capital investments at the margin) and accords with the 4 percent rate used to develop the highway baseline needs estimates. The fact that many transit assets are long-lived also supports the use of a lower rate.

The baseline estimates were made in constant 2005 dollars. The breakdown of the various components of the total baseline amounts are examined by the paper in 2005 dollars. The baseline totals have also been converted to three different current dollar bases, assuming average annual inflation rates of 2.0 percent, 2.5 percent and 3.0 percent over the projection periods.

Scope

Historically, the C&P Report has provided projections of capital investment needs only.
The baseline needs in this paper include estimates of future transit operating expenses, in keeping with the mandate of the Section 1909 Commission to address total future surface transportation funding needs. It should also be noted that the baseline capital and operating needs in this report assume contributions for Federal, State and local sources combined. Assigning responsibility for these needs to any particular entity or level of government is beyond the scope of the present analysis although it may be a subject for further consideration by the Commission.

Baseline Transit Needs Estimate

Exhibit 1 presents the baseline transit needs by expenditure type from 2005 to 2055. Total transit expenditure needs in constant 2005 dollars are estimated to be $1.1 trillion cumulatively through 2020; $2.4 trillion cumulatively through 2035; and $4.6 trillion cumulatively through 2055. Seventy percent of these amounts are estimated to be for operating expenses, based on the relationship between operating expenses and total expenses over the past 10 years. Total transit capital investment needs are estimated to be $322 billion cumulatively through 2020, $702 billion cumulatively through 2035, and $1.4 trillion cumulatively through 2055. Capital investment for rehabilitation and replacement is estimated to account for 48 percent of total investment needs through 2020 ($156 billion cumulatively), and 40 percent of total investment needs ($554 billion cumulatively) for the entire 50-year projection period. Capital investment to expand transit assets to meet an average annual growth in transit ridership of 1.57 percent is estimated to be 23 percent of total investment needs through 2020 ($75 billion cumulatively), and 37 percent of total investment needs through 2050 ($316 billion cumulatively); capital investment to improve transit performance by adding vehicles and associated infrastructure to reduce crowding and increase passenger travel speed time by investments in heavy rail, light rail and bus rapid transit are estimated to be 28 percent of total investment requirement through 2020 ($91 billion cumulatively) and 22 percent ($316 billion cumulatively) of total investment requirements through 2055. Given that TERM's speed improving investments are more heavily concentrated toward the beginning of the forecast period, it is possible that these rail dominated investments are underestimated, particularly over the longer term. However, the size of any underestimation in speed improving investment and the extent to which it would replace the cost of investing in bus modes to reduce crowding has yet to be determined. TERM estimates that the investments to reduce crowding, and improve speeds, will lead to cumulative 50-year increases in passenger miles traveled of 4.3 billion and 0.6 billion respectively.

Exhibit 1
Baseline Transit Needs Projections by Expenditure Type[1,2]
(Billions of 2005 Dollars)

Type of Improvement	15-year 2005—2020	30-year 2005—2035	50-year 2005—2055
Replacement and Rehabilitation	$156	$323	$554
Asset Expansion	$75	$206	$510
Performance Improvement	$91	$173	$316
Investment Needs	**$322**	**$702**	**$1,379**
Operating Needs[3]	**$740**	**$1,614**	**$3,172**
Total Needs	**$1,062**	**$2,316**	**$4,551**

Notes:
[1]Needs estimated by TERM, with the exception of rural and special service needs which are based on a more simple model and calculated outside TERM.
[2]Assumes a 4 percent discount rate.
[3]Assumes operating needs are 70 percent of total needs

Source: Transit Economic Requirements Model and FTA Staff estimated for rural needs and operating expenses.

Investment by Asset Type

Exhibit 2 breaks down the transit investment needs by asset type in 2005 dollars. Cumulative rail investment from 2005 through 2020 is estimated to be $211 billion; cumulative investment in non-rail through 2020 is estimated to be $110 billion. Cumulative investment in rail through 2055 is estimated to be $840 billion; cumulative investment in non-rail through 2055 is estimated to be $540 billion. Based on this forecast, rail's share of total transit investment falls from 65.7 percent of the total in the 2005-2020 period to 60.9 percent of the total in the 2005-2050 period. This declining share of rail investment is primarily the result of higher projected growth in transit travel demand for urban areas currently served by non-rail modes (i.e., bus, paratransit and vanpool).

With the exception of short-term investments to increase operating speeds in select urban areas, TERM does not assume a long-term systematic substitution of rail for bus service in these higher growth urban areas. Investment in vehicles is forecast to be $126 billion cumulatively through 2020, or 39 percent of the total, and $635 billion cumulatively through 2055 or 46 percent of the total. Part of the increase in total investment for vehicles is in rural areas; investment in rural vehicles is forecast to account for 9 percent of cumulative vehicle investment needs over the 50-year projection period. This rural vehicle estimate is based on the same assumptions used to project rural vehicle needs for the 2006 C&P Report, and assumes unmet and growing needs in rural areas.

Exhibit 2
Baseline Transit Capital Investment Needs by Asset Type
(Billions of 2005 Dollars)

Asset Type	15-year 2005—2020	30-year 2005—2035	50-year 2005—2055
Rail	$211	$444	$840
Non-Rail	$110	$258	$539
Total of Which	$322	$702	$1,389
Vehicles	$126	$292	$635
Guideway	$63	$137	$242
Stations	$36	$70	$131
Facilities	$31	$72	$132
Systems	$26	$53	$107
Other Project Costs	$40	$78	$132

Impact of Inflation on Total Baseline Needs

Exhibit 3
Baseline Transit Capital Investment
(Billions of Current Dollars)

Average Annual Inflation Rate	15-year 2005—2020	30-year 2005—2035	50-year 2005—2055
0.0%	$1,062	$2,316	$4,551
2.0%	$1,264	$3,264	$8,331
2.5%	$1,321	$3,567	$9,783
3.0%	$1,381	$3,904	$11,525

Exhibit 3 provides cumulative baseline investment needs in current dollars assuming no inflation (equal to 2005 constant dollar amounts), 2.0 percent, 2.5 percent and 3.0 percent. The impact of inflation on the constant dollar estimates is directly related to the length of the forecast period.

Maintain Conditions and Performance Needs Estimate

Exhibit 4 provides cumulative transit investment estimates to maintain transit conditions and performance. These needs estimates do not include investment to improve transit service performance, i.e., to reduce crowding or to increase the speed of passenger travel. These estimates are only slightly lower than the amounts needed to improve conditions because, on average, the estimated condition of the Nation's transit assets is close to the target of "good" set by the improve condition, baseline scenario. Rehabilitation and replacement costs are lower than the baseline estimate because they assume that assets are allowed to deteriorate slightly more before being replaced.

Exhibit 4
Transit Investment to Maintain Conditions and Performance[1,2]
(Billions of 2005 Dollars)

Type of Improvement	15-year 2005—2020	30-year 2005—2035	50-year 2005—2055
Replacement and Rehabilitation	$146	$310	$538
Asset Expansion	$75	$204	$504
Investment Needs	$220	$514	$1,402

TCRP H-33A, State and National Transit Investment Analysis – A Comparison with 2006 C&P Report Results

In late 2006, the Transportation Research Board's (TRB) Transit Cooperative Research Program (TCRP) completed a study of transit infrastructure investment needs, "State and National Transit Investment analysis" for use by the American Association of State Highway and Transportation Officials (AASHTO) in revising the 2002 "Bottom Line Report", in anticipation of the next surface transportation reauthorization cycle. These TCRP study projected estimates are in 2004 dollars and are provided on an average annual basis for a 2005 to 2024 projection period, the same period covered by the projections in the 2006 C&P Report. The TCRP investment estimates and the 2006

C&P Report estimates are presented in Exhibit 5. Both sets of estimate are based on the same ridership assumptions and a comparable estimate of the Nation's transit asset base.

Exhibit 5
Comparison of 2006 C&P Report and TCRP Project H-33 Investment Needs Results
(Billions of 2004 Dollars)

Scenarios	2006 C&P Report	2006 TCRP Study	% Difference
Maintain Conditions & Performance	$15.8	$310	+27
Improve Conditions & Performance	$21.8	$30.2	+38

Source: U.S. DOT and TCRP. Both studies assume 1.57% ridership growth.

This TCRP report estimates that the costs to maintain conditions and performance will be 27 percent higher and the costs to improve conditions and performance 38 percent higher costs than the 2006 Conditions and Performance Report estimates.[1,2] While both sets of projections are based on the 2004 National Transit Database (NTD) data for urban vehicles, the capital asset data in the TERM database, and an average annual increase in transit passenger travel of 1.57 percent, they incorporate different rehabilitation and replacement (R&R) cycles. Exhibit 6 compares the TCRP report and the TERM methodologies.

The C&P Report results are based on TERM which determines asset R&R cycles on estimated physical condition ratings for each individual asset, and statistically-derived asset decay functions and reinvestment threshold functions based on actual asset condition data. Computations are at the individual asset level, i.e., for each asset, at each agency, by mode. The model developed for TCRP, on the other hand, bases R&R decisions solely on asset age, and applies replacement thresholds based on assumptions regarding the expected service life by asset class to improve conditions, or twice the dollar-weighted average age of assets by asset class to maintain conditions. Computations in the TCRP model are aggregated by asset class according to initial year of service. These assumptions have the effect of rehabbing and replacing certain assets earlier than might realistically be expected, thereby driving up estimated R&R costs; TERM avoids this problem with its application of decay functions. TERM also restricts the number of miles of new rail alignment that can be con-

[1] Cambridge Systematics, Inc. 2006. TCRP Project H-33(A): *State and National Transit Investment Analysis*. Transportation Research Board. Pp. ES-2 – ES-3.

[2] The TCRP report presents a range of needs based on three assumptions of growth rates in transit ridership (1.57%, 2.355%, and 3.5%). This is the same range used by the sensitivity analysis in Chapter 10 of the 2006 C&P Report. The TCRP improve conditions and performance needs estimate, which is based on the highest ridership growth rate ($45.3 billion), may be quoted by analyses supporting higher transit funding levels. For the purposes of comparison, only the baseline assumption, which applies the same 1.57% rate of growth in transit ridership, is presented here.

structed within a given urban area during a one-year period to represent real world project funding and construction capacity constraints.

TERM, unlike the TCRP analysis, uses a benefit-cost analysis in estimating investment needs. TERM compares the discounted stream of ongoing costs (including operations and maintenance (O&M0, rehab and replacement, and asset expansion) by agency by mode to the discounted stream of benefits to riders from the continued operation of the mode. TERM conducts two tests and excludes asset expansion costs or asset expansion plus R&R costs from the national tally of investment needs if these costs (plus O&M costs) are greater than the estimated benefits. A similar test is conducted for stand-alone system expansion projects. Because the TCRP analysis does not apply a benefit-cost test, all of its recommended investments are based on engineering assumptions only.

Exhibit 6
Comparison of C&P Report and TCRP H-33 Study Methodologies

Investment Type	TCRP	TERM
Rehabilitation & Replacement (Maintain and Improve Conditions)	Replace all assets that currently exceed their minimum useful life (to improve conditions) or twice the dollar-weighted average age of assets by asset class (to maintain conditions)	Replace assets as their physical condition falls below a predetermined threshold to (1) maintain the current average physical condition of the nation's assets in the long-run or (2) improve overall conditions to "good"
Expansion to Maintain Performance	Assumes US ridership will increase at 1.57% annually; the assumed cost to service 1/3rd of new riders is the average cost per new rider for recent New Starts projects; the cost for the remaining 2/3^{rds} is estimated by expanding the current value national asset inventory (from TERM) in proportion to the growth in non-New Starts ridership	Expand the existing asset base of each urban area at the same rate as the locally projected increase in transit passenger miles
Expansion to Improve Performance	Uses TERM's projections	Invest in (1) transit operators with excessive overcrowding and (2) urbanized areas with low average transit operating speeds

A final major difference between the TCRP model and TERM concerns the methodologies used to estimate transit expansion needs to maintain current service performance. The TCRP analysis estimates that the dollar value of the Nation's transit asset base will grow in proportion to the average growth in national ridership; one-third of the expansion growth is assumed to have an average cost per new rider for New Starts projects as reported in the FY05-FY07 Reports to Congress, while the remaining two-thirds of the expansion growth is estimated by expanding the national asset inventory in proportion to the growth in non-New Starts ridership (using TERM's inventory of the Nation's transit assets as a measure of the current baseline). In contrast, TERM expands the asset holdings of the nation's local transit agencies based on local, urban-area specific forecasts of growth in travel demand. However, in doing so TERM only invests in those agency modes that surpass a minimum vehicle occupancy threshold. These investments are designed to maintain current transit performance standards given projected growth in travel demand. TERM's unit costs for system expansion are derived from a database of actual project costs dating back as far as the 1970s (and in

some cases earlier). These costs have been inflated to TERM's base-year of analysis using the Means Construction Index.

The TCRP study uses the same improve performance estimates as the 2006 C&P Report, which were produced by TERM and provided to TCRP by FTA. These performance improving investments are designed to reduce vehicle overcrowding for the highest ridership operators and to increase operating speeds for regions with low average transit speeds.

Comparison of TERM Results with Capital Plans of Representative Transit Agencies

TERM's investment estimates at the most detailed asset classification were compared with the capital improvement programs of several large and multi-modal transit agencies for this report, to gauge how closely TERM determines transit capital needs. Only the costs for existing infrastructure reinvestment were addressed in these comparisons; expansions of capacity, particularly line extensions and new lines, were not included.

TERM's underlying theory and structure make its longer-term cumulative needs estimates more accurate than its estimates of year-by-year needs, particularly in the near-term. TERM's estimates will tend to be higher than transit agency estimates for two reasons. First, TERM's are derived independently from funding considerations, whereas transit agency capital improvement plans typically include projects for which funding has largely been secured. This is evidenced by large differences between TERM investment estimates for SEPTA and the investments in the SEPTA capital improvement plan. Secondly, TERM assumes that the total expenditure for an asset will occur in the year that the asset must be rehabilitated or replaced (including the cost of immediate replacement of all assets currently past their assessed useful life); it does not reflect the fact that agency capital programs incorporate annual construction draw downs based on factors such as available funding, maintaining operations during construction, and construction scheduling. This evidenced by the large dollar value and percentage differences between TERM results and the NYCT capital improvement program.

TERM will tend to under-estimate needs because it assumes that most assets are replaced in-kind based on acquisition costs. TERM replacement costs, except for vehicles, do not reflect increases resulting from asset betterments and improvements from advancing technology and changing design standards, whereas these cost increases are considered by agency capital programs. TERM's replacement costs for vehicles which are based cost data reported to FTA's TEAM (Transportation Electronic Awards Management) implicitly include betterments.

Finally, all agencies (including FTA through TERM) use their own methods and assumptions when developing their capital improvement plans. This includes differences in assumed capital costs, assessed condition and useful life by asset type, investment priorities, and capital needs identification processes. Together, these differences in assumptions ultimately yield significant differences in assessed capital needs, not just with TERM, but also between the individual CIP plans themselves. Given these many considerations, it should be expected that TERM's needs estimates will frequently differ from those presented in local agency CIP plans. The value of these comparisons lies in identifying where TERM may be making consistent, systematic prediction errors, and using the information to correct those errors.

Exhibit 7 compares TERM's rehabilitation and replacement estimates with the capital improvement plan (CIP) estimates of six transit operators. These documents, annually updated by transit agencies, establish near-term annual projections of capital needs in the context of limited funding availability.

They establish relative priorities among projects and typically identify funding sources at the project level.

Exhibit 7
Comparison of Agency Capital Improvement Plans Estimates with 2004 TERM Results by Asset Class

AGENCY	Guideway	Facilities	Systems	Stations	Vehicles	Non-Revenue Equipment	Total CIP To TERM Comparison
MBTA	◒	◒	●	◒	◒	●	◒
SEPTA	◒	●	●	◒	●	●	●
WMATA	●	◒	◒	●	●	●	○
CTA	●	●	●	◒	●	●	●
Metra	●	●	◒	◒	◒	●	●
MUNI	◒	◒	◒	◒	◒	◒	◒
BART	◒	◒	○	●	●	○	◒
Total Asset Class to TERM Comparison	◒	●	○	◒	○	●	

● Over-Estimated ○ Closely Estimated ◒ Under-Estimated

- **Massachusetts Bay Transportation Authority, Boston (MBTA):** The TERM investment estimates for all vehicle modes (excluding ferry boat and non-revenue vehicles), guideway, and stations are lower than in the MBTA CIP; the TERM investment estimates for non-revenue vehicles and systems are higher than in the MBTA CIP. In the near-term, TERM projects lower total capital investment needs than in the MBTA CIP.
- **Southeastern Pennsylvania Transportation, Philadelphia (SEPTA):** The TERM investment estimates for SEPTA stations and guideway are lower than in the SEPTA CIP; and TERM estimates for SEPTA facilities, systems, LR vehicles, paratransit vehicles, and non-revenue vehicles are higher than in the SEPTA CIP. Overall, TERM's investment estimates are higher than in the SEPTA CIP. These differences can be explained, at least in part, by the fact that SEPTA operates under considerable financial constraints.
- **Washington Metropolitan Area Transit Authority (WMATA):** The TERM estimates of investment in facilities, systems, and IT are lower than in the WMATA CIP. TERM estimates of investment in guideway, stations, and vehicles (heavy rail and motorbus) are higher than in the WMATA CIP. Overall, TERM near-term needs estimates are relatively close those in the WMATA CIP for 2006 to 2008. The TERM estimates of WMATA's system-wide needs are lower than those in the WMATA CIP for the 2008 to 2013.
- **Chicago Transit Authority (CTA):** The TERM estimates of investment to reconstruct rail stations is lower than in the CTA CIP; the TERM estimate of investment in bus rolling stock; power & way/electric, signal, communications and track & structure; rail rolling stock, and system-wide Facilities & equipment are higher than in the CTA CIP. Overall, the TERM estimate of investment for CTA is higher than the investment in the CTA CIP.
- **Metra:** TERM's investment estimates for rolling stock, signal-electrical-communications, and stations & parking are lower than in the Metra CIP, and the TERM estimates for track, and

structure and support facilities and equipment are higher than in the Metra CIP. Overall, TERM estimates for Metra are higher than in the Metra CIP primarily due to the higher TERM estimates for track and structure needs.

- **San Francisco Municipal Transportation Agency (MUNI):** In the near-term, TERM estimates for investment in bus guideway; trackwork; facilities for administration, central control; computers & software; electrification; in-station revenue collection; revenue vehicles for light rail, motor bus, and trolleybus are lower that in the MUNI CIP. TERM estimates for investment in bus guideway (in the long-term); facilities for maintenance; on-vehicle revenue collection; and non-revenue vehicles are higher than in the SFTMTA CIP. Overall, TERM total investment estimates for lower than SFTMTA's in the near-term and the longer-term.
- **San Francisco Bay Area Rapid Transit District (BART):** TERM investment estimates mainline track & structure and controls & communications are lower than in the BART CIP. TERM estimates of investment in rolling stock (in the longer-term) and in stations are higher than in the BART CIP. TERM is relatively close to the BART CIP estimate for work equipment. Overall, the TERM investment estimates are lower than those in the BART in the BART CIP due to the lower TERM estimates for mainline track & structure needs.

Exhibit 8 compares TERM backlog estimates with State of Good Repair (SGR) for the three major transit operating agencies of the New York Metropolitan Transportation Authority. TERM defines backlog as the total of deferred investment at the baseline year of the analysis. The MTA defines SGR projects as those that correct for previously deferred maintenance or replace aging equipment and facilities that are already beyond their useful lives.[3]

Exhibit 8
Comparison of NYMTA State of Good Repair (SGR) with 2004 TERM Results by Asset Class

AGENCY	Guideway	Facilities	Systems	Stations	Vehicles	Non-Revenue Equipment	Total CIP To TERM Comparison
NYCT	◒	○	●	●			●
LIRR	●						●
MNR	◒	◒	◒	●			○
Total Asset Class to TERM Comparison	●	●	●	●			

● Over-Estimated ○ Closely Estimated ◒ Under-Estimated

- **MTA New York City Transit (NYCT):** TERM's backlog investment estimates are lower than the agency's SGR estimates for line equipment, line structures, power, and yards, and higher for passenger stations, signals & communications, shops and about the same for depots. Overall, TERM backlog estimates are higher than the agency's SGR capital plan.

[3] There are 3 components to the MTA capital program: SGR (which is equivalent to TERM backlog, NR (which is equivalent to TERM annual needs based on condition of existing assets), and System Improvement or SI (which is equivalent to TERM's improve conditions scenario, but was not addresses as the improvements by MTA generally did not address capacity improvements.

- **MTA Long Island Railroad (LIRR):** TERM backlog estimate for structures is higher than in the agency's SGR investment plan. Structures are the only components of the LIRR SGR capital program.
- **MTA Metro North (MNR):** TERM's backlog estimates for track, communications & signals, and shops & yards are lower than in the agency SGR investment plan. TERM backlog estimate for stations is higher than in the agency's estimate in its SGR capital plan. Overall, TERM estimates are lower than in the agency's SGR capital plan.

Exhibit 9 compares TERM annual estimates with Normal Replacement (NR) for the three major transit operating agencies of the New York Metropolitan Transportation Authority. The MTA defines NR projects as those that maintain good repair by replacing components as they reach the ends of their useful lives.

Exhibit 9

Comparison of NYMTA Normal Repair (NR) with 2004 TERM Results by Asset Class

AGENCY	Guideway	Facilities	Systems	Stations	Vehicles	Non-Revenue Equipment	Total CIP To TERM Comparison
NYCT	◒	◒		●	●	◒	O
LIRR	◒		◒	O	●		O
MNR	●	●	◒	◒	◒		O
Total Asset Class to TERM Comparison	O	◒	◒	●	O	◒	

● Over-Estimated O Closely Estimated ◒ Under-Estimated

- **MTA New York City Transit (NTCT):** TERM's investment estimates are lower than the agency's near-term for buses, track, signals & communications, power, yards, depots, service vehicles, are lower for subway cars, passenger stations, and line structures, and are about the same for line equipment. TERM's average longer-term investment needs estimates are relatively close to agency average near-term needs.
- **MTA Metro North (MNR):** TERM has a lower estimates track, communications & signals, shops & yards, and power. TERM overestimates rolling stock, and structures. TERM estimates are relatively close for stations. Overall, TERM underestimates agency needs in the near-term, but longer-term needs show an upward trend.
- **MTA Long Island Rail Road (LIRR):** TERM underestimates investment rolling stock, stations, communications & signals, and power. TERM overestimates investment track and shops & yards. Overall, TERM underestimates agency needs.

FTA has found similar discrepancies between TERM and agency CIPs; however, when FTA aggregated the CIPS of 16 transit agencies, TERM's results were only 5.5 percent higher than the investment in their CIPs combined. The 16 agencies in the FTA comparison included the 10 agencies mentioned above and AC Transit (Oakland, CA), Dallas Area Rapid Transit (DART), Metropolitan Atlanta Rapid Transit Authority (MARTA), Pace (Suburban Chicago), Northern Indiana Commuter Transit District (NCTD), and Valley Transit Authority (San Jose, CA).