WESTPORT ISLAND

ROAD SURVEY

1989

Presented by:

THE ROAD COMMITTEE

Chairman - Elford Richardson

Road Commissioner - Frank Cromwell
Raye Amirault
Vic Churchill
Bill Mitman

ADVISORS

Selectmen - Paul Hodgdon
Mel Applebee

TABLE OF CONTENTS

PURPOSE

The Town of Westport voted to authorize a general survey of each Town Road to determine it's current general condition, to locate specific areas that cause continuing deterioration, and to estimate the cost for bringing each road to a reasonable standard condition with respect to "safety" and with respect to "ease of routine annual maintenance".

The Town of Westport requested this study so it would have a valid reference for town residents to use when they vote on appropriating future road budgets, and when they vote on where and how these budgets should be allocated.

The primary purpose of the Committee was to research the current accepted practice of:

1. constructing a well-designed road
2. properly maintaining a well-constructed road
3. budgeting for both construction and maintenance

PROCEDURE

Each Town Road was reviewed according to the following guidelines:

* School Bus accessibility in all weather
* Allowance for school bus and snow plow to pass
* Snow plowing problems
* Mechanical abuse on vehicles
* General safety of travel for all residents

The two most critical road characteristics were evaluated:

1. Surface material and condition
2. Water drainage:

   crowns
   slopes
   ditches
   culverts
   tree roots
   ledge interferences

In an attempt to analyze the problem of Town Roads maintenance, the Committee made a physical inspection of all roads and consulted with:

Westport Selectmen and Road Commissioner
Maine Department of Transportation
Harry C. Crooker & Sons Contractors
Jack A. Shaw & Sons Inc., Contractors
Frank Cromwell Contractors

DEFINITION OF TERMS

ROAD - A road is composed of:

1. pavement surface (asphalt or gravel)
2. subbase layer (compacted gravel)
3. subgrade layer (the natural soil)

It should be designed to properly carry the expected loads, to allow safe passage of all vehicles, and to provide general wear and skid resistance.

DITCH - The trench on each side of a road that is created to carry water away from the road. Proper ditching permits surface and subgrade water to drain from the road.

BACKSLOPE - The backside of the ditch which must be properly sloped to prevent erosion of soil into the ditch. Preferable slope is 2 to 1.

SHOULDER - Section of road between the travel surface and the ditch side slope which prevents the travel surface from eroding into the ditch. With the 18 ft width (or less) of Travel Surface on Town Roads, the shoulders should be adequate to support vehicle loads when trucks or school bus meet.

CROWN - The cross-section contour of a road at the center which facilitates water drainage to the side ditches. Crown slope should be 1/2 to 3/4 inch per foot for gravel road width.

ROAD SURFACE - Gravel roads require a minimum depth to allow for proper annual maintenance. There must be sufficient material for the grader to "crown" the road creating the desired slope toward the ditch. Gravel surface must be a well-graded granular material so that it will remain stable through freezing and thawing cycles, and should be 12 inches in depth.

WATER DAMAGE - The primary cause of road damage is water - water on the road and water under the road. The most severe water damage occurs when water under the road surface freezes. In Maine the effects of water on roads is termed "devastating" by the Technical Services Division of The Department of Transportation.

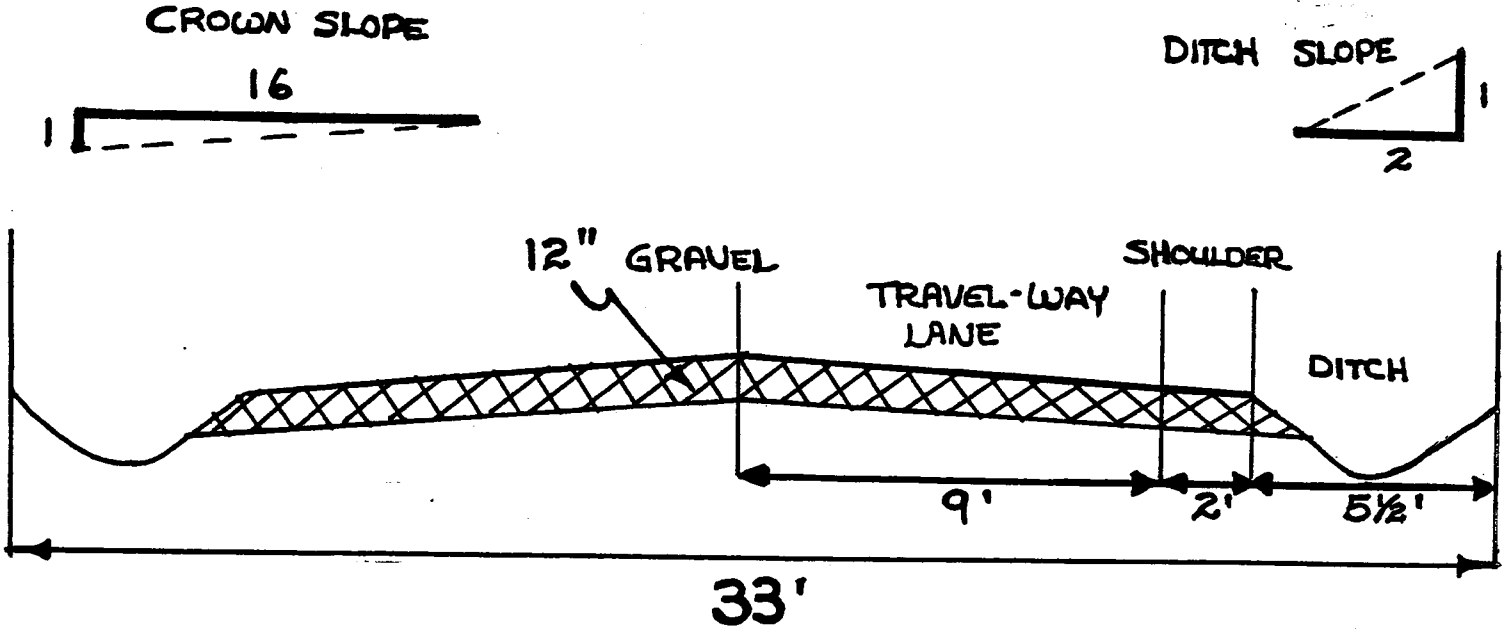
LOAD DAMAGE - Traffic road damage depends more on the weight of vehicles rather than on the number of vehicles using a road. It takes 500,000 axles carrying one ton each (passenger car) to produce the same damage as 11 axles carrying 16 tons each. (Quoted from Technical Services Division, Maine Local Roads Center Department of Transportation.)

CONSTRUCTION QUALITY - The following construction factors seriously affect the performance and life of a road:

a. cross-section design
b. subgrade quality
c. moisture condition during construction
d. soil compaction
e. composition of paving materials
f. seasonal temperatures during construction
g. annual maintenance - what, when and how it is performed

DIAGRAM OF ROAD CROSS-SECTION

2 ROD ROAD

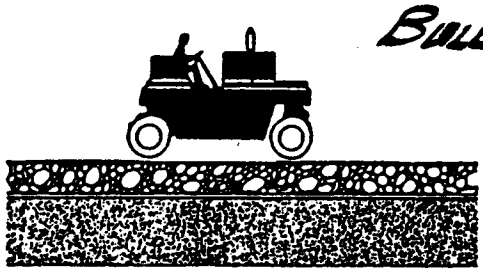


NOTE: Westport's Town Roads, except for the portion of Rt. 144 now maintained by Westport, are almost entirely two-rod (33 ft) width of Right-of-Way. In many cases, this does not provide enough width to properly slope ditches or to create safe shoulders.

The Town would have to acquire easements from property owners to allow cutting slopes back onto private property, where necessary, if good drainage is to be maintained.

DEPT. of TRANSPORTATION BULLETIN

JUST WHAT IS A ROAD ?



Anatomy of a Road

A road is composed of three major elements:

- the pavement
- the base and/or subbase layer(s)
- the subgrade

The *pavement surface* or "wearing surface" may be asphalt, concrete, brick, cobblestone, or other material. It must provide wear resistance as well as skid resistance.

The *base and/or subbase layers* provide the support for the pavement surface. This material consists of compacted gravel, sand, crushed rock, or a combination of these. A minimum compacted thickness should be 18 inches for local roads.

The MDOT designs all non-Interstate roads with a subbase layer only. (The use of a "base layer" has not been routinely specified since the 1960's.) The subbase material should be a blend of sand and gravel with a small percentage (less than 10%) of fine particles such as silt and clay. The maximum stone size should not exceed 6 inches. The fine particles fill the voids between the sand and gravel particles and act as a "binder" to hold the mass together when compacted. When too much fine material is used, the material does not drain well and can provide poor support, especially during the spring thaw.

If your town is in a part of the State where good subbase material is not readily available, you may need a 3 to 4 inch "base layer" above the subbase layer. This base layer is typically a crushed or screened gravel and it provides a good working surface which can be "smoothed up" quite easily. The only drawback is that it is expensive and it can significantly add to the cost of road work.

The third element is the *subgrade layer*. This could be fill material if an embankment is being built to a height more than 2' to 3' high. However, the subgrade layer of a local road which normally follows the contour of the land is the natural soil upon which the subbase lies. It is this surface which ultimately carries the traffic loads.

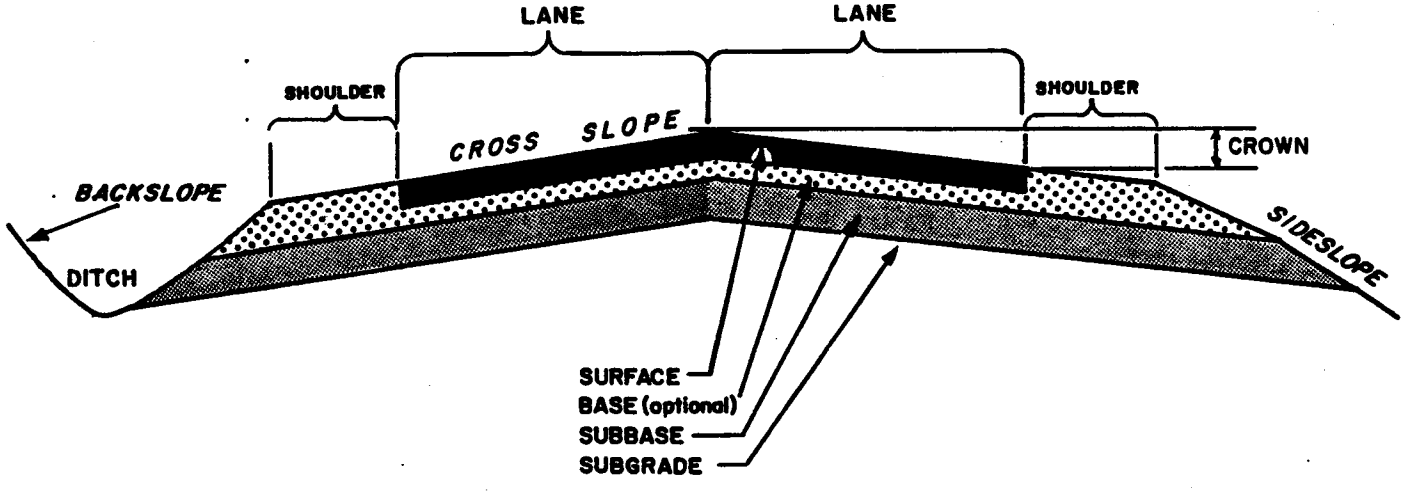
Before construction of a road, the top 12 to 24 inches of existing ground is usually prepared by removing large boulders, stumps, bushes, and other objectionable materials.

A Road's Function

The main function of the pavement surface and the subbase materials is to support a wheel load and to spread and transfer that load to the subgrade. Hopefully, the internal strength of the pavement and subbase structure will be able to carry the load. The ultimate load on the natural subgrade surface should be small enough to be easily supported by the subgrade.

The elements of a typical road are illustrated below. The road surface should be "crowned" or sloped so that water will drain to the left or right towards the ditch. The slope should be 1/4 inch per foot of asphalt road width and 1/2 to 3/4 inch per foot of gravel road width.

Potholes in gravel surface roads can be directly related to road crown. Those roads with no crown will experience the most severe pothole problem and those with 1/2 inch per foot or more crown will have very few pothole maintenance problems.



A TYPICAL ROAD CROSS-SECTION

WESTPORT ISLAND ROAD PROBLEMS

Westport Town Roads have especially difficult conditions which are considered more severe than most other small towns in this area. These are:

* abundance of ledge and steep drops
* shallow soil depth
* mature trees which block ditch areas, and shade roads preventing evaporation of moisture
* culvert decay or clogging
* limited maintenance budget

Until our roads can be reconstructed to have sufficient crown, adequate ditching, proper gravel composition, and working culverts, annual maintenance will continue to be spot repairs on a more or less crisis basis.

If and when our roads have been reconditioned to provide good drainage and adequate travel surface, the annual budget must include sufficient funds to grade Travel Way and shoulders at least twice a year. Roads that are paved still require shoulders to be graded twice a year, also, to remove winter sanding material as well as growth of weeds and brush.

GENERAL HISTORY

In the past there were many sections of Westport roads where automobiles might be mired in the Spring of the year. To a great extent these problem areas have been corrected by excavating ditches to drain off water and the addition of gravel to stabilize the road surface.

Prior to 1970 Rt. 144, maintained by the State, was the only fully paved road. This originally was a "tarred" or macadam pavement. Periodically, possibly every year, this was given another spray coating of tar and covered with sand thus building up the thickness of paved surface.

In the early 1970's some of the Town's gravel roads were paved by a surface treatment of tar. This served to lessen the amount of grading required for gravel surface Travel Way. However, grading of shoulders was neglected.

No follow-up applications of tar and sand were made and, as the growth of weeds and brush and build up of sand accumulated on shoulders, poor drainage caused the hardened surfaces to break up in many areas. There were sections of paving where adequate gravel base and free drainage of water resulted in longer life of the surface pavement. In some areas an additional application of "hot top" or asphalt pavement was made and the road surface was retained.

Other areas were left in broken condition or had gravel added and were thereafter treated as gravel roads. However, the acknowledged necessity of frequent grading of gravel roads has not been done.

The rapid increase in population of Westport during the past ten years with its attendant construction activity has resulted in greatly increased traffic of both cars and heavily loaded trucks on most roads.

It is readily apparent that our Road Budget which was intended to cover necessary routine maintenance is <u>not</u> keeping pace with the wear from this greatly increased highway use.

Town Roads 1963 to 1988

	1 Town Highway	2 Town Bond Improvement (State)	3 State Aid (Town)	4 State Aid (State)	5 Town Appr.	6 Surplus	7 Excise Tax	8 Donations	9 Credits	10 Overdraft	11 Balance	12 Special Appr. Bushes	13
1963	27625.51	1828.99		701.22	2600.00				124.17	38.42			
1964	28434.48	2797.28	1066.00	4136.13	1500.00	100.00			307.00	36.43			
1965	41654.41	2590.61	2132.00	6671.93	3650.00			N.E. 300.00	10.00	205.41			
1966	35205.57	2399.29			1800.00		1420.57	" 300.00					
1967	49936.00	4094.83	1066.00	6609.20	2701.60		1177.56	" 300.00		71.47			
1968	52305.52				2500.00		2196.04	" 300.00	284.48			350.00	
1969	43475.14	1775.30			1500.00		2229.12	" 600.00		16.02			
1970	52446.00		1066.00	3934.00	1500.00		3454.60	Glenn Rd. 290.00					
1971	57177.94	2343.24	1332.00		1500.00		3917.21	N.E. 300.00					
1972	59455.22		1332.00		2500.00		5438.63				2035.41	2672.29	
1973	111891.73	3383.90		2928.00	3500.00		6081.10	Pierce Ave. W.S. 620.00		665.22	2025.41		
1974	42179.60					1500.00		100.00	220.00	419.60			
1975	76509.75				500.00		7993.66				842.91	CETA 5155.76	
1976	72150.03				2500.00	R.S. 3666.30			150.00		1033.67		
1977	82387.11		2254.00			R.S. 1544.64	5000.00			1694.07			
1978	103250.00		1266.00			R.S. 3852.00	4473.00						
1979	119845.45		1333.00		2350.00	351.00	6121.45				10.52		
1980	111752.24		1333.00			200.00	9999.48		10.52		247.76		
1981	158922.68		1466.00		2500.00		7652.92	W.S. 500.00	247.76		81.00		
1982	169973.91		1500.00		5000.00	600.00	5600.00			297.39	Donation	350.00	Bd. 150.000 Cliffford Rd.
1983	210427.76				5000.00	600.00	6600.00	Buckley Rd. 1000.00	S.A. Land 3954.00		1511.24	Don. 45.00	" "
1984	370371.12				6000.00	600.00	16000.00	Bd. 1511.24	S.A. 12000.00		4474.12		
1985	383891.87				6000.00		20000.00	Bd. 4472.12	S.A. 12000.00		4087.25		
1986	271337.87				6000.00		20000.00	Bd. 4087.25	S.A. 12000.00	926.12	20000.00	4067.50	Donations
1987	64002.75				6000.00		20000.00	Bd. 20000.00	S.A. 12000.00	6002.75			
1988	397467.06				6000.00		20000.00		S.A. 12000.00	481.09		1286.02	T.H. Fund

COST ESTIMATES PER OPERATION

To estimate the probable cost of road improvements is very difficult without the benefit of professional engineering to determine actual quantities and operations needed. Opinions of those consulted differ because sections of our roads vary widely in their condition, and the decision whether to remove trees, blast ledge, or move road centers must be made before accurate estimates are meaningful.

However, the following cost guidelines are accurate enough for considering a plan:

TREE REMOVAL - $400-$500 per mature tree

SURFACE GRAVEL - $16/yard for 3/4 inch crushed gravel spread and graded

BASE GRAVEL - $10/YARD spread and graded

LEDGE BLASTING - $60/yard

DITCHING - $1,000 to $1,500/day to excavate and haul material to DEP approved disposal site on Westport

Dumping the organic mass from ditching operations is a serious problem and requires DEP. permit. The length of ditching per day will vary with terrain being worked and might be 700 to 1,500 feet.

GRADING - $400-500/day to grade 2 miles

This estimate applies only where sufficient surface material is already in place and no new material is needed.

RECONSTRUCTION OF EXISTING GRAVEL ROAD - This includes cutting brush or trees necessary for excavation of ditches and disposal of waste material, applying additional gravel, culvert replacement as needed, and final grading.

Very rough estimates for reconstruction have varied from $7/ft to $20/ft. It would appear that $7/ft would be adequate for all but the worst condition where a quantity of ledge excavation would be required. There are many sections of Town roads that would require less work and could be brought to acceptable gravel road condition for $3 to $5/ft.

PAVING OVER RECONSTRUCTED GRAVEL ROAD - $10/ft for 18 foot width, or $9/ft for 16 foot width

CONCLUSIONS

It is important to remember these critical rules of intelligent road construction:

* A paved road eliminates annual Travel-Way grading, annual gravel additions, and annual clearing of ditches which fill as a result of the grading operations.

* All road construction operations should be performed during appropriate seasonal weather and temperatures.

* All gravel roads should be graded 3 times each year between mud season and late October.

* Shoulders and ditches should be cleared each year without exception. Effective water drainage is the single most important aspect of road maintenance.

* Dumping of material gathered during ditching operations may require DEP permission.

* Combining road reconstruction into large projects encourages several contractors to aggressively bid on them. This gives us a better chance of getting the right equipment here at the right time, resulting in lower unit costs of the various work items.

* Supervise completion of all work to an acceptable standard.

* Adequate seasonal load posting is essential to protect roads from damage by heavily loaded trucks.

The obvious result of this research was to firmly establish what Westport residents have long suspected:

1. Westport has a difficult geography for road construction and maintenance.

2. The size of our Road Budget, and our method of allocating the funds do not achieve a solution to our road problems. Our small budget has been divided between all roads in an effort to be "fair" which has meant that no road received enough money to provide any lasting improvement.

The considered opinion of the Road Committee is that the Town should contract to have all roads improved to a condition ready to be paved, and then subsequently paved under additional contracts. This would sufficiently improve roads to the point where maintenance costs could be more accurately estimated for our Budget each year. The maintenance, prior to paving, would primarily be road grading, ditch cleaning, and culvert replacement. When roads are paved, the grading is confined to just shoulders and ditch slopes.

We have two choices in budgeting for well-designed roads:

1. Divide the approximate 24 miles of Westport Roads into an annual program, and then carefully reconstruct 1 - 2 miles per year to an engineering standard of quality.

Reconstruct 2 miles		Pave 1 1/2 miles	
$65,000	Reconstruction	$65,000	Paving
25,000	Town Rd Maint.	25,000	Town Rd Maint.
$90,000		$90,000	

   Some residents prefer their road not be paved, straightened, or widened because they want to preserve rural character and control speed. Each road's residents should be surveyed to determine the amount of reconstruction they desire. Oviously, the improvement program can be completed in half the time if paving is not included.

2. Or, consider a two-stage Bond Issue to do the roads all at once. Stage 1 would cover gravel reconstruction costs and Stage 2 would cover the paving costs. This would save the Town from the rapidly increasing costs due to inflation of materials, equipment and labor each year.

   It is possible that the interest payments on a bond issue could be largely off-set by escalating construction costs incurred each year, and the larger maintenance costs of roads prior to completion of reconstruction.

NOTE: Upon completion of 1. or 2., have a separate annual budget for maintenance of the reconstructed roads, as they are completed, to preserve the new road condition.

In anticipation of strong resistance from taxpayers to the annual payments of a Bond Issue, the Selectmen have indicated the current Road Budget might be increased to approximately $90,000 without a tax increase, by using more Excise Tax funds and Highway Reserve funds. The Town could then reconstruct 2 miles of gravel road each year or pave 1 1/2 miles of 16 foot wide roadway.

ROAD COMMITTEE FUNCTIONS:

* Assist the Selectmen and Road Commissioner.

* Create a continuation of the Road Committee with rotating terms for members to allow a smooth transition.

* This committee should file an annual report to each Town resident.

* Because of the wide variation in estimates, competitive bidding is essential to careful budgeting. The Road Committee can help design the road section for bidding.

* Use the Road Committee to help track construction performance and budget allocation to projects approved by the Town.

* The Department of Transportation, Technical Services Division has a Maine Local Roads Center which offers excellent workshops for road construction training. Some of these should be attended by the Road Committee and the Road Commissioner.

TOWN OF WESTPORT ** ESTIMATED ** MMBB SPRING 89

YEAR	PRINCIPAL	RATE	INTEREST	DEBT SERVICE	ANNUAL DEBT FISCAL YEAR
APR25 89					
OCT25 89			$27,857.83	$27,857.83	
APR25 90			$33,653.75	$33,653.75	$61,511.58
OCT25 90	$75,000.00	6.500%	$33,653.75	$108,653.75	
APR25 91			$31,216.25	$31,216.25	$139,870.00
OCT25 91	$75,000.00	6.500%	$31,216.25	$106,216.25	
APR25 92			$28,778.75	$28,778.75	$134,995.00
OCT25 92	$70,000.00	6.500%	$28,778.75	$98,778.75	
APR25 93			$26,503.75	$26,503.75	$125,282.50
OCT25 93	$65,000.00	6.500%	$26,503.75	$91,503.75	
APR25 94			$24,391.25	$24,391.25	$115,895.00
OCT25 94	$65,000.00	6.600%	$24,391.25	$89,391.25	
APR25 95			$22,246.25	$22,246.25	$111,637.50
OCT25 95	$65,000.00	6.600%	$22,246.25	$87,246.25	
APR25 96			$20,101.25	$20,101.25	$107,347.50
OCT25 96	$65,000.00	6.600%	$20,101.25	$85,101.25	
APR25 97			$17,956.25	$17,956.25	$103,057.50
OCT25 97	$65,000.00	6.600%	$17,956.25	$82,956.25	
APR25 98			$15,811.25	$15,811.25	$98,767.50
OCT25 98	$65,000.00	6.600%	$15,811.25	$80,811.25	
APR25 99			$13,666.25	$13,666.25	$94,477.50
OCT25 99	$65,000.00	6.750%	$13,666.25	$78,666.25	
APR25 00			$11,472.50	$11,472.50	$90,138.75
OCT25 00	$65,000.00	6.900%	$11,472.50	$76,472.50	
APR25 01			$9,230.00	$9,230.00	$85,702.50
OCT25 01	$65,000.00	7.000%	$9,230.00	$74,230.00	
APR25 02			$6,955.00	$6,955.00	$81,185.00
OCT25 02	$65,000.00	7.100%	$6,955.00	$71,955.00	
APR25 03			$4,647.50	$4,647.50	$76,602.50
OCT25 03	$65,000.00	7.100%	$4,647.50	$69,647.50	
APR25 04			$2,340.00	$2,340.00	$71,987.50
OCT25 04	$65,000.00	7.200%	$2,340.00	$67,340.00	
APR25 05			$0.00	$0.00	$67,340.00
OCT25 05		7.250%	$0.00	$0.00	
APR25 06			$0.00	$0.00	$0.00
OCT25 06		7.250%	$0.00	$0.00	
APR25 07			$0.00	$0.00	$0.00
OCT25 07		7.300%	$0.00	$0.00	
APR25 08			$0.00	$0.00	$0.00
OCT25 08		7.300%	$0.00	$0.00	
APR25 09			$0.00	$0.00	$0.00
OCT25 09		7.400%	$0.00	$0.00	
					$0.00
	$1,000,000.00		$565,797.83	$1,565,797.83	$1,565,797.83

NET INT COST 6.780%
AVG LIFE (YR) 8.35