

# **SCARBOROUGH FIRE DEPARTMENT**



## **APPARATUS REPLACEMENT PROGRAM UPDATE**

**PREPARED FOR THE TOWN MANAGER AND  
SCARBOROUGH TOWN COUNCIL**

March 2019

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## **EXECUTIVE SUMMARY**

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The Scarborough Fire Department is pleased to present this revision of our Apparatus Replacement Program. Our goal is to remain proactive in our approach to planning for the replacement of apparatus in a cost effective and prudent way while recognizing current challenges and meeting national standards for safety.

### **HISTORICAL REVIEW**

This report chronicles the history of our replacement plan which was established in the 1940's and has served our department and community well for nearly 80 years.

### **REASONS FOR RE-EVALUATION OF THE PROGRAM**

The report reviews a number of compelling reasons for re-evaluating the current replacement program including:

- The significant increase in calls for service the department is currently and is projected to respond to
- The impact of environmental changes due to the use of corrosive chemicals for deicing roads
- Increasing cost and lack of availability of replacement parts and components
- Challenges with the timing of previous purchases due to a tragic accident in 1980
- Conformance with national standards for safety and best practices

### **FIRE APPARATUS REPLACEMENT**

The fire apparatus replacement plan shifts the scheduled service life of Class A apparatus from 25 years to 20 years. It also analyzes the current practice of specifying one standardized type/model of fire engine, and proposes a different plan that incorporates smaller, more cost effective solutions for half of the fleet depending on the district the apparatus will serve from.

### **AMBULANCE REPLACEMENT**

The proposal reviews the two different ambulance replacement programs we have operated under for the past several years, and based on data collected from those plans, outlines a more cost effective solution for replacing these critical resources going forward.

### **SUMMARY**

The Scarborough Fire Department's goal is to continue to be proactive in our approach to apparatus replacement. We recognize the investment that these resources require and have developed a plan that balances safety and operational efficiency with the reality of the modern workload due to the growth in our community and increasing volume of calls for service.

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## **INTRODUCTION**

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The specific purpose of this revision is to accomplish the following objectives:

1. Review the history of the department's apparatus replacement program
2. Analyze the reasons for re-evaluation of the current program
3. Transition the replacement of Class A fire apparatus from 25 to 20 years
4. Outline a new cost effective program for replacing ambulances

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## **HISTORICAL REVIEW**

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The Scarborough Fire Department is proud to say that we have planned ahead for the routine replacement of apparatus since the 1940's. The early leaders of our organization understood that fire apparatus are costly but necessary tools for the protection of our citizens. They developed this program so that funds could be saved over several years to cover the cost of replacement when a unit had fulfilled its duty and was at end of useful life.

That useful life was determined to be 25 years, a frequency that hasn't changed in nearly 80 years since the original plan was developed in the 1940's. However, it is important to note that the Town of Scarborough and our fire department has changed dramatically over that same time. The once quiet fishing and farming community is now a bustling suburb of Portland. Our volunteer fire department which was fully staffed with true volunteers from the various neighborhoods, is now a large municipal department with a combination of full-time, part-time, and paid on call members. Instead of responding to less than 100 calls annually, we now respond to over 4,200 calls/year.

These and other reasons warrant a re-evaluation of our existing replacement plan so that the men and women that serve and protect the citizens of Scarborough have safe and effective apparatus to work from.

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## **REASONS FOR RE-EVALUATION OF THE PROGRAM**

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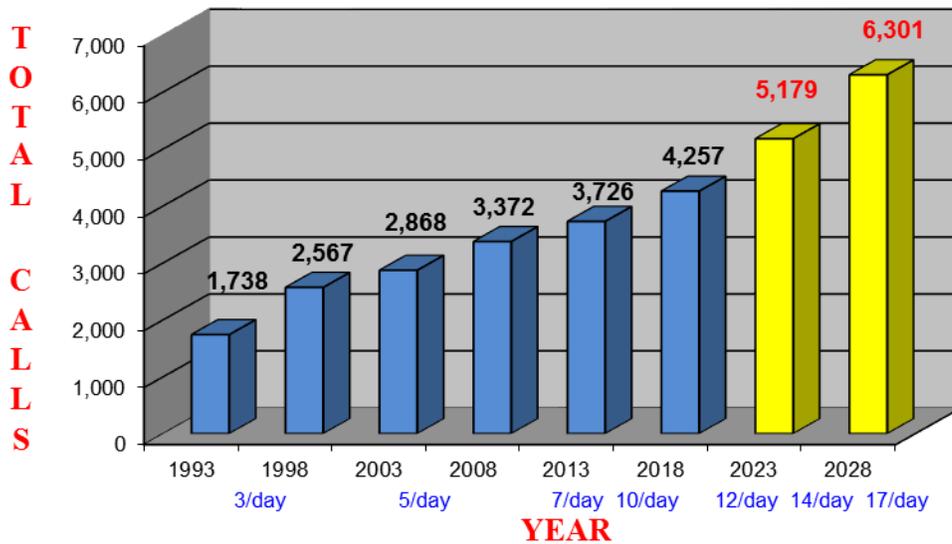
The fleet of apparatus in service today reflects the hard work of members of the Scarborough Fire Department Standing Truck Committee in designing, maintaining and overall care of these very expensive assets. However, the realities of an increasing call volume, the complexities of modern apparatus, as well as updated safety standards makes a 25 year replacement cycle problematic.

Determining the proper or "right" replacement cycle for specific municipalities is dependent on many factors. Some of those factors include the intended or changing use of the apparatus, call volume, vehicle mileage, engine hours, maintenance cost, and most importantly available budget funding. Other factors include the growth of the community and the changes of service demands on the department.

### **Calls for Service Volume**

The town of Scarborough has changed and grown significantly over the last 25 years. The effect of that growth has been seen in the need for expanded town services including such things as larger schools, more police officers, and demand for services from the fire department. A review of the calls for service over the last 25 years has shown a yearly increase in service demand of just under 4%. This totals an increase in calls of service of 145% in 25 years (Since 1993).

## CALLS FOR SERVICE



*2023 & 2028 estimates based on previous 25 year average increase of 4.0% annually*

This increase in calls for service is the factor that has most drastically impacted the service life of our apparatus. This effects the vehicle’s mileage, engine hours, maintenance costs, exposure to elements, and general overall longevity of the vehicle. As little as 25 years ago a fire truck 30 years old would be retired with less than 30,000 miles. Today, the Scarborough Fire Department has trucks in service under 20 years old with over 100,000 miles.

### Environmental Factors

A significant environmental factor for fire departments in the northeastern United States is combating corrosion, especially in driveline components and frame rails. Chemicals like Calcium and Magnesium Chloride which are being used for deicing on our roads today, are contributing factors to the significant corrosion problems we now experience.

In an effort to mitigate this issue the Scarborough Fire Department instituted a new program several years ago to help assure that apparatus would make it to its full 25 year life span without an unexpected failure. We instituted a Capital Improvement Program (CIP) mid-life refurbishment program where expensive corrosion repairs and painting was performed at the approximate mid-life of the apparatus (at the 12-13 year mark). The average cost for refurbishing each apparatus averages \$50,000 - \$60,000 for a pumper and significantly more for a ladder truck.

The most recent truck to be refurbished was the 2006 E-One® engine originally assigned to the Oak Hill Station. This work was completed this past year. The refurbishment consisted of extensive removal of rust from the frame rails along with replacement of springs and suspension components. Additionally the truck was sent to a vendor to correct corrosion on the body and re-painting. Once completed, the truck was assigned to the Pleasant Hill Station as Engine 3. This change in assignment is a component of the current replacement policy, to re-assign older apparatus to stations with lower call volumes. The former Engine 3 was a 1990 E-One® engine that was replaced in 2016 after 26 years of service when we purchased the new Engine 7.



*Undercarriage and frame corrosion on E7 after only 12 years of service*



*Exterior paint corrosion on doors and compartments caused by road chemicals*

### **Cost & Availability of Parts**

Another challenge of keeping apparatus beyond their useful life is the high cost and limited availability of replacement parts. One recent example of this was when the mechanical shifting mechanism on a 1996 engine assigned to the Pine Point Station failed this past year leaving the truck out of service. Parts were no longer available for the transmission and the only option was a “work-around” using a computerized electronic shifting mechanism. This repair cost was over \$4,000.00 for a truck that is 21 years old and not due for replacement until 2021.

### **Timing of Prior Purchases**

One of the challenges of our replacement program is that four of our ten primary response apparatus were all replaced over a two-year period from 1980-81. This was in the aftermath of the tragic crash of Ladder 1 & Engine 7 while enroute to a structure fire in North Scarborough resulting in the line of duty death of Firefighter Bill Quentin. Those two apparatus were destroyed and the town elected to replace Engine 1 & 4 at the same time as they were both due for replacement and to save money on a multi-truck purchase. Between 1998-2006 we tried to stagger the replacement of those units, but we are still faced with a difficult period in our replacement plan where multiple apparatus require replacement in a relatively short time frame.

## Current State of Apparatus

The Scarborough Fire Department operates a fleet of ten “heavy” or Class A apparatus consisting of seven pumping engines, two ladder trucks and one heavy rescue squad. These ten large vehicles are critical to maintain fire suppression capabilities especially for structural fire protection. These assets are strategically housed among the six neighborhood fire stations to maintain adequate coverage and conform to recommendations of the insurance grading schedule (ISO).

The age of our Class A apparatus ranges from two years old to twenty-nine years old. The current average age is fourteen years. The average mileage for all heavy apparatus is 73,800 with the highest being nearly 135,000.

	Year	Age	Mileage
Engine 1	2009	9	44113
Engine 2	1989	29	134926
Engine 3	2006	12	74151
Engine 4	1996	22	Inoperable
Engine 5	2004	14	83053
Engine 6	2004	14	88871
Engine 7	2016	2	16218
Squad 7	2007	11	Inoperable
Ladder 1	1998	20	121517
Ladder 2	2014	4	24257
Average		14	73800

This assessment does not include the seven smaller vehicles used for Emergency Medical (EMS) responses and smaller fire incidents such as brush fires. Those vehicles include three ambulances, two forestry trucks, and three utility style vehicles. These smaller vehicles are used whenever possible in an effort to extend the life of the larger, more expensive, suppression apparatus.

## Maintenance Cost and Replacement

A review of maintenance records was utilized to analyze the true total cost of the 25 year replacement cycle and project the cost of a shortened cycle. We were limited to records dating from 2002 forward because of a change in Public Work’s maintenance software. Our analysis included the original purchase price, the yearly cost of maintenance (parts and labor), the estimated value, and the projected replacement cost for each vehicle. An analysis of each apparatus was completed in a separate spread sheet and from that data averages for yearly maintenance, as well as replacement costs and estimated values were calculated. An example of that data for both an engine and ladder truck are included in Appendix 2.

This analysis revealed that our current annual maintenance cost for each of the ten Class A apparatus is just over \$8,000.00 annually. Our analysis shows how the annual maintenance cost rises with the age of the vehicle. Calculating the averages based on 5 year increments revealed a steady increase in annual maintenance cost totaling 200% over 20 years.

Average Annual Maintenance Cost per Vehicle					
Current Average	1-5 Year	5-10 Year	10-15 Year	15-20 Year	Over 20 Years
<b>\$8,100.99</b>	<b>\$4,283.18</b>	<b>\$8,238.22</b>	<b>\$11,213.15</b>	<b>\$13,135.28</b>	<b>\$15,037.37</b>

The estimated value of each vehicle was analyzed utilizing a literature review of manufacturer’s publications and research into current pricing of used apparatus. The goal was to determine a reasonable estimation of revenue for the sale of apparatus at end of useful life. Much the same as in personal vehicles, the majority of value for heavy apparatus is lost in the first 5 years of its life.

Another consideration is the increase in replacement cost which historically has averaged over 4% annually. Using a 25 year service life, the replacement cost has generally been 120-130% of the original purchase price. In order to determine the most cost effective replacement cycle, the comparison

of the replacement cost to the resale value must be determined. Historically the resale value of apparatus replaced at 25 years has been extremely low as illustrated in the table below:

<b>Resale Value as a Percentage of Replacement Cost</b>				
<b>5 Years</b>	<b>10 Years</b>	<b>15 Years</b>	<b>20 Years</b>	<b>25 years</b>
<b>39%</b>	<b>18%</b>	<b>8%</b>	<b>3%</b>	<b>1%</b>

### **Safety & National Standards**

The National Fire Protection Association (NFPA) 1911 - Inspection, Maintenance, Testing, and Retirement of In-Service Emergency Vehicles (2017 Edition) is the standard that provides the recommended minimum requirements for establishing a program for the inspection, maintenance and testing for in-service fire apparatus. It also contains guidelines for fire apparatus refurbishment and retirement; the standard’s recommendations apply to all in-service fire apparatus, regardless of the year of manufacture. Annex D of NFPA 1911; Guidelines for First-Line and Reserve Fire Apparatus states:

*“In the last 10 to 15 years, much progress has been made in upgrading functional capabilities and improving the safety features of fire apparatus. Apparatus more than 15 years old might include only a few of the safety upgrades required by the recent editions of the NFPA fire department apparatus standards or the equivalent Underwriters Laboratories of Canada (ULC) standards. Because the changes, upgrading, and fine tuning to NFPA 1901 have been truly significant, especially in the area of safety, fire departments should seriously consider the value or risk to firefighters of keeping apparatus more than 15 years old in first line service.”*

The standard goes on to recommend that *“apparatus more than 15 years old that have been properly maintained and that are still in serviceable condition be placed in reserve status”*. The standard does not recommend apparatus over 25 years old remain in service.

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## **FIRE APPARATUS REPLACEMENT**

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The proposed changes to the fire apparatus replacement plan involves four components. The first is to gradually transition from a 25 year to a 20 year replacement schedule. Second is to recognize that there are very different fire suppression challenges between the areas of Scarborough that are served by a pressurized fire hydrant system south of the turnpike, and the northern section of town that requires rural water supply tactics. The third change is to eliminate the expensive mid-life refurbishing except for the ladder trucks. Finally the plan continues to use smaller, less expensive service and staff vehicles to respond to emergency medical calls which make up the majority of our calls for service.

The tables on the next page illustrate the proposed replacement plan update. The top section lists the Class A apparatus along with their model year, refurbishing year (if completed) and the fiscal year of their proposed replacement and age at that time. The middle section simply organizes that same information by fiscal year chronologically. The bottom section outlines a plan for the ancillary units on an 8-20+ year replacement goal based on assignment and use.

**Scarborough Fire Department**  
**Apparatus Replacement Plan**  
 Revised 2/4/19

**Full Size Apparatus - 20 year replacement goal**

Unit	Model	Refurb	Replacement		Notes
	Year	Year	FY	Age	
Engine 1	2009	N/A	2031	22	Assigned to E6 in 2020
Engine 2	1989	Done	2020	31	
Engine 3	2006	Done	2028	22	Formerly E7 / assigned to E2 in 2025
Engine 4	1996	Done	2022	26	Formerly E7
Engine 5	2004	N/A	2024	20	
Engine 6	2004	2019	2025	21	Assigned to E2 in 2020 / new truck to E3 / E3 to E2
Engine 7	2016	N/A	2031	15	Assigned to E2 in 2031
Ladder 1	1998	Done	2021	23	
Ladder 2	2014	2024	2034	20	

**Full Size Apparatus Replacement Plan by Fiscal Year**

FY 20: Replace E2 after 31 years of service / new smaller model truck assigned to E1  
 old larger model E1 with CAFS becomes E6 / E6 becomes spare E2

FY 21: Replace L1 after 23 years of service

FY 22: Replace E4 after 26 years of service with smaller truck

FY 24: Replace E5 after 20 years of service

FY 25: Replace E2 (formerly E6) after 21 years of service / new smaller model truck assigned to E3  
 Old E3 (formerly E7) assigned to E2.

FY 28: Replace E2 (formerly E3 & E7) after 22 yrs. of service / new truck assigned to E6 / E6 (formerly E1) now E2

FY 31: Replace E7 after 15 years / old E7 becomes E2 / sell '09 E2 (formerly E1 & E6) after 22 years of service

FY 34: Replace L2 after 20 years of service

**Ancillary Units - 8 - 20+ year replacement goal based on assignment & use**

Unit	Model	Refurb	Replacement		Notes
	Year	Year	FY	Age	
Unit 6	2013	N/A	2020	7	replacing a used cruiser with another used cruiser
Unit 5		N/A	2022		Proposed new vehicle primarily for EMS response
Unit 2	2010	N/A	2023	13	Pickup truck with plow
Marine 1	1990	N/A	2023	33	17' Rigid hull inflatable
Marine 4	1999	N/A	2026	27	21' Boston Whaler shared with Harbor Master & Police
Unit 7	2016	N/A	2028	12	Stake body utility truck with plow
Forestry 3	2016	N/A	2029	13	Stake body utility truck with plow
Squad 7	2007	N/A	2030	23	Heavy rescue with hydraulic extrication tool system
Staff Cars	various	N/A	various	8-12	Chiefs, fire inspector, duty officer varies by use & mileage
Forestry 4	2006	2021		15	Re-chassis mini-pumper with CAFS unit & forestry tools

For many years the department has standardized on a similar design for our fleet of fire apparatus for several reasons. The primary reason is that we employ a large and diverse group of full-time, per-diem, and paid on call members who often work on different trucks at different stations. Having our apparatus' set up and operate as similarly as possible simply makes sense. It also is more efficient for stocking parts and maintaining our fleet. Our proposal maintains a similar level of standardization, but also recognizes that there are distinct differences in the operational needs from one section of Scarborough to another.

In the southern section of the Town (south of the turnpike), a system of pressurized fire hydrants adequately covers those fire districts. Those areas also contain some of the densest developments with narrow streets and limited access. In the northern section of Scarborough we need to employ rural water supply tactics which includes drafting from static sources like dry hydrants and cisterns, and using larger trucks carrying more water with them.

Compressed Air Foam (CAF) capability is something we have traditionally invested in due to its ability to help extinguish fires quicker and with less water. This is an expensive option that also requires a larger truck. The proposed changes to our plan include moving to a specification that includes two options to meet the specific needs of the district the apparatus will serve in. In the southern districts the truck will be smaller and better able to negotiate the dense neighborhoods. It will have a smaller water tank and hose bed, and will not contain CAFS. The two trucks housed at the Route 1 stations and the one in North Scarborough will remain similar to our current design with larger water tanks, CAFS, and larger hose beds to meet the rural water supply challenges of that district.

The third change from our current plan is to eliminate the mid-life refurbishing for pumpers. After analyzing the cost and benefits of our previous practice we have decided that if we are able to replace after 20 years as proposed, we can save the cost of that work at the 12-13 year mark. The ladder trucks will be the exception to that rule due to their high cost of replacement and complexity. Spending some money on mid-life maintenance will help guarantee they will make it to the 20 year replacement goal.

Finally our plan continues to take advantage of the savings in using smaller ancillary vehicles for service and emergency medical runs. Over several years we have added pick-up trucks and other service vehicles to our fleet at each station as space is available. These units are used as much as possible to respond to calls when it is appropriate and safe to do so which saves fuel and maintenance costs over using a full-size apparatus.

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## **AMBULANCE REPLACEMENT**

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As demands for EMS services have increased dramatically, the department has refined our ambulance replacement program to meet the need. In 2005 we entered into an agreement with a vendor through a formal bid process where we replaced one of our three ambulances each year over a three-year cycle. At the end of the third year the vendor would guarantee a 50% trade-in value for the old truck against the cost of a new one so long as we kept the mileage within certain limits. This program allowed us to cost effectively rotate the ambulances while they were still covered under the manufacturer's warranty which minimized maintenance costs.

As calls for services increased as well as the mileage that we incurred responding to those calls, we found it difficult to meet the maximum mileage requirement in that agreement with the vendor. At the same time the cost of new ambulances had increased to the point that in 2014 we needed to re-evaluate that program to find a more economical model. At that time we were able to show that by keeping the ambulance an additional two years for a total of five years of service we could re-chassis the existing box, then replace the entire ambulance after a total of 10 years. Our analysis showed that we could save \$183,000 over 10 years from the previous replace annually model we had been operating under.

Now that we have been through the first rotation of re-chasseing after five years we believe there are further savings that we can achieve by eliminating that step and the associated costs, and simply keeping the ambulances longer. In the table below we have projected \$323,984 in savings over ten years by keeping the ambulances for an average of 7 years before total replacement without re-chasseing.

Because we don't have any experience with what are anticipated to be increased maintenance costs with this plan, we have made provisions in the replacement program for the first ambulance to be replaced after six years, the second after 7, and the third after 8 which will generate the necessary data to determine the most cost effective long-term solution.

<b>Scarborough Fire Department Ambulance Replacement Program Analysis</b>			
Fiscal Year	Net Cost Under Old 5/10 Year Rechassis/Replace Plan	Type of Replacement Under Old Plan	Net Cost Under New 6-8 Year Total Replacement Plan
2020		No Purchase	
2021		No Purchase	
2022	254,080	Total Replace	
2023	261,702	Total Replace	261,702
2024	269,553	Total Replace	
2025		No Purchase	277,640
2026		No Purchase	
2027	120,528	Rechassis	294,548
2028	124,143	Rechassis	
2029	127,868	Rechassis	
2030		No Purchase	
	1,157,874		833,890
<b>Net Savings Over 10 Years</b>			<b>323,984</b>

*Costs include a 3% annual inflation factor*

*Costs also includes the cost of the power lift stretcher system*

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### SUMMARY

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We hope this report has provided the information necessary to support the changes to our long-standing apparatus replacement program. We are proud of the fact that our predecessors recognized the need for long-term planning for the replacement of these critical tools. The fact is that the plan outlined nearly 80 years ago isn't meeting the current needs of the department or the community we serve. We never want to be in a position to come to the Town Council reactively with an urgent request to replace a key apparatus that wasn't planned and budgeted for. Our goal is to be proactive by establishing a plan going forward that is realistic, meets safety standards and codes, and is operationally efficient.

**APPENDIX 1**  
**CURRENT VS PROPOSED APPARATUS REPLACEMENT PLAN**

**Scarborough Fire Department**  
**Current vs. Proposed Apparatus Replacement Plan**  
Revised 2/4/19

FY	Current Plan based on 25 Year Replacement				Proposed Plan based on 20 Year Replacement			
	Apparatus	Replacement	Staff/Unit	Refurb	Apparatus	Replacement	Staff/Unit	Refurb
2020			Staff Car Unit 6 (used)	Engine 5	Engine 2		Staff Car Unit 6 (used)	
2021	Engine 4		Unit 2 Forestry 4 (re-chassis)		Ladder 1		Forestry 4 (re-chassis)	
2022		New		Engine 1	Engine 4		Unit 5	
2023	Ladder 1	New			Marine 1	New (after 6 yrs.)	Unit 2	
2024	Engine 2	New	Staff Car		Engine 5			Ladder 2
2025	Marine 1		Unit 6 (used)		Engine 2 (formerly E6)	New (after 7 yrs.)	Unit 6	
2026	Marine 4		Unit 3	Ladder 2	Marine 4		Staff Car Unit 3	
2027	Canteen	Re-chassis	Unit 7		Canteen	New (after 8 yrs.)		
2028	Engine 5	Re-chassis			Engine 2 (formerly E3/7)		Staff Car Unit 7	
2029	Engine 6	Re-chassis					Staff Car Forestry 3	
2030	Squad 7		Staff Car x 2		Squad 7		Staff Car	
2031	Engine 3		Unit 2		Engine 7			
2032	Command Van				Command Van			
2033								
2034					Ladder 2			

1. Future pumpers designed for district served based on two standard specifications. E1, E3 & E4 will be smaller units for the hydranted districts. E5, E6 & E7 will be similar to current design for the non-hydrant area with more water and hose.
2. Transitioning to a service life closer to 20 yrs. vs 25 for front-line trucks based on call volume & minimizing refurb costs.
3. Ambulance replacement plan eliminates the need/expense for a mid-life re-chassis process.

## APPENDIX 2 MAINTENANCE COST ANALYSIS

### 1006, Engine 6

Date Purchased: 2004      Make: E-ONE  
 Program Replacment: FY2029      Model: CYCLONE  
 Purchase Price: \$369,675.00

\$369,675.00      3.5%/year

Fiscal Year	Material	Labor	Total Maintenance	Est. Value	Est. Replacment
2004-2005	\$396.65		\$3,685.25	\$4,081.90	\$314,223.75
2005-2006	\$1,393.56		\$3,165.00	\$4,558.56	\$277,256.25
2006-2007	\$3,707.27		\$3,242.25	\$6,949.52	\$240,288.75
2007-2008	\$2,506.43		\$3,684.38	\$6,190.80	\$203,321.25
2008-2009	\$1,304.67		\$3,795.00	\$5,099.67	\$177,444.00
2009-2010	\$2,022.59		\$3,791.51	\$5,814.10	\$158,960.25
2010-2011	\$5,293.41		\$1,761.19	\$7,054.60	\$140,476.50
2011-2012	\$9,779.83		\$3,578.94	\$13,358.77	\$129,386.25
2012-2013	\$12,806.39		\$3,604.20	\$16,410.58	\$118,296.00
2013-2014	\$10,348.71		\$3,369.92	\$13,718.63	\$107,205.75
2014-2015	\$7,107.84		\$4,393.23	\$11,501.07	\$96,115.50
2015-2016	\$35,902.30		\$2,420.31	\$38,322.61	\$86,873.63
2016-2017	\$14,056.58		\$4,692.14	\$18,748.72	\$77,631.75
2017-2018	\$17,593.63		\$5,058.57	\$22,652.20	\$69,776.16
2018-2019	\$3,432.26		\$799.80	\$4,232.06	\$61,920.56
Refurb				\$50,000.00	\$57,000.00
2019-2020					\$55,913.34
2020-2021					\$49,906.13
2021-2022					\$45,470.03
2022-2023					\$41,033.93
2023-2024					\$37,522.01
2024-2025					\$34,010.10
2025-2026					\$31,052.70
2026-2027					\$28,095.30
2027-2028					\$25,692.41
2028-2029					\$23,289.53
<b>Totals:</b>	<b>\$127,652.11</b>	<b>\$51,041.67</b>	<b>\$228,693.78</b>		
<b>Avg/year:</b>	<b>\$8,510.14</b>	<b>\$3,402.78</b>	<b>\$14,293.36</b>		

