

MASSACHUSETTS MUTUAL VARIABLE ANNUITY SEPARATE ACCOUNT 4

FORM 485BPOS

(Post-Effective Amendment (investment company, rule 485(b)))

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FORM N-4

REGISTRATION STATEMENT UNDER THE SECURITIES ACT OF 1933

☐ Pre-Effective Amendment No.

☒ Post-Effective Amendment No. 39

and/or

REGISTRATION STATEMENT UNDER THE INVESTMENT COMPANY ACT OF 1940

☒ Amendment No. 240

(Check appropriate box or boxes.)

Massachusetts Mutual Variable Annuity Separate Account 4

(Exact Name of Registrant)

Massachusetts Mutual Life Insurance Company

(Name of Depositor)

1295 State Street, Springfield, Massachusetts 01111-0001

(Address of Depositor's Principal Executive Offices)

(413) 788-8411

(Depositor's Telephone Number, including Area Code)

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1295 State Street

Springfield, Massachusetts 01111-0001

(Name and Address of Agent for Service)

Approximate Date of Proposed Public Offering: **Continuous**

It is proposed that this filing will become effective (check appropriate box)

- ☐ immediately upon filing pursuant to paragraph (b) of Rule 485
- ☒ on April 29, 2024 pursuant to paragraph (b) of Rule 485
- ☐ 60 days after filing pursuant to paragraph (a)(1) of Rule 485
- ☐ on _____ pursuant to paragraph (a)(1) of Rule 485

If appropriate, check the following box:

- ☐ This post-effective amendment designates a new effective date for a previously filed post-effective amendment.

Title of Securities Being Registered: **Units of Interest in MassMutual Transitions SelectSM, an Individual or Group Deferred Variable Annuity Contract.**

MassMutual Transitions SelectSM Variable Annuity

Issued by Massachusetts Mutual Life Insurance Company

Massachusetts Mutual Variable Annuity Separate Account

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This prospectus describes an individual deferred variable annuity contract (Contract) offered by Massachusetts Mutual Life Insurance Company ("MassMutual[®]," "Company," "we," "us"). The Contract offers a choice of features and benefits. You, as the Owner of the Contract ("you," "Owner"), determine which ones may be appropriate for you, based on your financial circumstances and objectives. The fees and charges that you pay are based on the features and benefits applicable to your Contract. We no longer sell the Contract. However, we continue to administer existing Contracts.

You may accumulate value under your Contract by allocating your money to various fixed account choices (The Fixed Accounts) and/or one or more variable investment divisions (Sub-Accounts) of Massachusetts Mutual Variable Annuity Separate Account 4 (Separate Account). Each Sub-Account, in turn, invests in one of the investment entities (Funds) listed in "Appendix A – Funds Available Under the Contract." The investment choices available to you are restricted if you elect certain optional features. See "Transfers and Transfer Programs – Asset Allocation Programs" for more information. You bear the entire investment risk for all amounts you allocate to a Sub-Account.

The Contract:

- is not a bank or credit union deposit or obligation.
- is not FDIC or NCUA insured.
- is not insured by any federal government agency.
- is not guaranteed by any bank or credit union.
- may go down in value.
- provides guarantees that are subject to our financial strength and claims-paying ability.

IF YOU ARE A NEW INVESTOR IN THE CONTRACT, YOU MAY CANCEL YOUR CONTRACT
WITHIN 10 DAYS OF RECEIVING IT WITHOUT PAYING FEES OR PENALTIES.

In some states this cancellation period may be longer. Upon cancellation, you will receive either a full refund of the amount you paid with your application or your total Contract Value. You should review the prospectus, or consult with your investment professional, for additional information about the specific cancellation terms that apply.

Additional information about certain investment products, including variable annuities, has been prepared by the Securities and Exchange Commission staff and is available at www.investor.gov.

The Securities and Exchange Commission has not approved or disapproved these securities or passed upon the adequacy of this prospectus. Any representation to the contrary is a criminal offense.

This prospectus is not an offer to sell the Contract in any jurisdiction where it is illegal to offer the Contract nor is it an offer to sell the Contract to anyone to whom it is illegal to offer the Contract.

Please read this prospectus before investing. You should keep it for future reference. It contains important information about the MassMutual Transitions Select Variable Annuity.

Effective April 29, 2024

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Glossary

Accumulation Phase. The period during which Purchase Payments may be made. Begins on the date the Contract is issued and ends on the date the Owner applies the full Contract Value to an Annuity Option or upon Contract termination.

Accumulation Unit. A unit of measure used to determine your value in a Sub-Account during the Accumulation Phase.

Age. The age of any Owner or Annuitant on his/her birthday nearest the date for which Age is being determined, except when discussed in regard to specific tax provisions.

Annuitant. The person(s) on whose life Annuity Payments are based, with the exception of the non-lifetime contingent option. See "The Income Phase – Period Certain Annuity Option." The term Annuitant also includes the joint Annuitant, if any. The Annuitant has no rights to the Contract.

Annuity Date. The date Annuity Payments begin. There may be more than one Annuity Date applicable to a Non-Qualified Contract if the Owner elects to apply only a portion of the Contract Value to an Annuity Option.

Annuity Options. Options available for Annuity Payments.

Annuity Payments. Series of payments made pursuant to the Annuity Option(s) elected.

Beneficiary. The person(s) or entity(ies) that the Owner designates to receive the death benefit provided by the Contract.

Business Day. Every day the New York Stock Exchange (NYSE), or its successor, is open for trading. Our Business Day ends at the Close of Business.

Close of Business. The time on a Business Day when the NYSE ends regular trading, usually at 4:00 p.m. Eastern Time. However, when the NYSE closes early or closes due to any emergency or SEC order, the Close of Business will occur at the same time.

Contingent Deferred Sales Charge (CDSC). A charge that may be assessed against each withdrawal from the Contract that exceeds the free withdrawal amount and amounts applied to Annuity Option E.

Contract. The MassMutual Transitions Select Variable Annuity; an individual deferred variable annuity contract.

Contract Anniversary. An anniversary of the Issue Date of the Contract.

Contract Value. The sum of your values in the Sub-Accounts and Fixed Account(s) during the Accumulation Phase.

Contract Year. The first Contract Year is the annual period which begins on the Issue Date and ends on the last calendar day before the first Contract Anniversary. Subsequent Contract Years begin on subsequent Contract Anniversaries.

Fixed Annuity Payments. Annuity Payments made during the Income Phase which we guarantee as to the dollar amount of each Annuity Payment.

Fund(s). The investment entities into which the assets of the Separate Account will be invested.

General Account. The Company's general investment account, which supports the Company's annuity and insurance obligations. The General Account's assets include all the assets of the Company with the exception of the Separate Account and the Company's other segregated asset accounts.

Good Order. Any application, Purchase Payments, withdrawal requests, or forms required by the Company which are satisfactory to the Company.

Income Phase. The period that begins on the Annuity Date and ends with the last Annuity Payment.

Issue Date. The date on which the Contract becomes effective. The Issue Date is included in the Contract.

Joint Owner. A person entitled to ownership rights under the Contract. See "Ownership – Owner."

Non-Business Day. Any day when the NYSE is not open for trading. Unless specified otherwise, if the due date for any activity required by the Contract falls on any day that is not a Business Day, performance of such activity will be rendered on the first Business Day following such due date.

Non-Qualified Contract. Your Contract is referred to as a Non-Qualified Contract if you purchase the Contract as an individual and not under a qualified plan such as an Individual Retirement Annuity (IRA), Roth IRA, or a corporate pension and profit sharing plan.

Owner. The person(s) or entity entitled to ownership rights under the Contract. We allow multiple Owners, subject to certain restrictions (see "Ownership"). Where we describe multiple Owners, we refer to them as Joint Owners.

Premium Tax. A tax imposed by certain states and other jurisdictions when a Purchase Payment is made, when Annuity Payments begin, or when the entire Contract Value is withdrawn.

Purchase Payment(s). Any amount paid to us by you or on your behalf with respect to the Contract during the Accumulation Phase, which may be decreased by the assessment of any applicable Premium Tax. Purchase Payments may not be added after the Annuity Date to any portion of the Contract Value that has been applied to an Annuity Option.

Qualified Contract. Your Contract is referred to as a Qualified Contract if it is purchased under a qualified retirement plan (qualified plan) such as an Individual Retirement Annuity (IRA), Roth IRA, or a corporate pension and profit-sharing plan (including 401(k) plans and H.R. 10 plans). For information on the types of qualified plans for which the Contract is available, see "Taxes – Qualified Contracts."

Required Minimum Distribution (RMD). A minimum amount the federal tax law requires to be withdrawn from certain Qualified Contracts each year. RMDs are generally required to begin by the required beginning date specified in IRC Section 401(a)(9).

Separate Account. The account that holds the assets underlying the Contract that are not allocated to The Fixed Accounts. The assets of the Separate Account are kept separate from the assets of the General Account and the Company's other separate accounts.

Service Center. MassMutual, Document Management Services – Annuities W360, PO Box 9067, Springfield, MA 01102-9067, (800) 272-2216, (fax) (866) 329-4272, (email) ANNfax@MassMutual.com, www.MassMutual.com. (Overnight mail address: MassMutual, Document Management Services – Annuities W360, 1295 State Street, Springfield, MA 01111-0001.)

Sub-Account(s). The Separate Account assets are divided into Sub-Accounts. The assets of each Sub-Account will be invested in the shares of a single Fund.

The Fixed Accounts. The Fixed Accounts for Dollar Cost Averaging, Fixed Accounts with a Long-Term Guarantee, and The Fixed Account are investment choices within our General Account. Purchase Payments allocated to The Fixed Accounts and transfers to The Fixed Accounts become part of our General Account.

Written Notice. A written or electronic communication or instruction sent by the Company to the Owner. Any notice the Company sends to the Owner will be sent to the Owner's last known address. The Owner must promptly provide the Company with notice of any Owner address change.

Written Request. A written communication or instruction sent by you to the Company. A Written Request must be in Good Order and must be received by the Company's Service Center. The Company may consent to receiving requests electronically or by telephone at the Service Center.

Important Information You Should Consider About the Contract

FEES AND EXPENSES		LOCATION IN PROSPECTUS
Charges for Early Withdrawals	<p><i>Standard CDSC.</i> If you withdraw money from your Contract within 7 years following your Issue Date, you may be assessed a Contingent Deferred Sales Charge (CDSC) of up to 7% of the amount withdrawn (less a 10% free withdrawal amount) or applied to Annuity Option E, declining to 0% after the seventh year.</p> <p>For example, if you elect the Standard CDSC under the Contract and we issued your Contract with a \$100,000 Purchase Payment, and you withdrew the \$100,000 Purchase Payment during the first two years after your Issue Date, you could be assessed a charge of up to \$6,300 on the amount withdrawn.</p> <p><i>Optional Nine Year CDSC.</i> If you withdraw money from your Contract within 9 years following your Issue Date, you may be assessed a CDSC of up to 8% of the amount withdrawn (less a 10% free withdrawal amount) or applied to Annuity Option E, declining to 0% after the ninth year.</p> <p>For example, if you elect the Optional Nine Year CDSC under the Contract and we issued your Contract with a \$100,000 Purchase Payment, and you withdrew the \$100,000 Purchase Payment during the first two years after your Issue Date, you could be assessed a charge of up to \$7,200 on the amount withdrawn.</p>	Charges and Deductions – Contingent Deferred Sales Charge (CDSC)
Transaction Charges	Currently, we do not assess a charge to transfer Contract Value among the Sub-Accounts during the Accumulation Phase. However, we reserve the right to charge \$20 per transfer in excess of 12 in a single calendar year.	Charges and Deductions – Transfer Fee

FEES AND EXPENSES			LOCATION IN PROSPECTUS
Ongoing Fees and Expenses (annual charges)	The table below describes the fees and expenses that you may pay <i>each year</i> , depending on the options you choose. Please refer to your Contract specifications page(s) for information about the specific fees you will pay each year based on the options you elected.		Charges and Deductions
	Annual Fee	Minimum	Maximum
	Base Contract		
	2008 Version	1.17% ⁽¹⁾	1.97% ⁽¹⁾
	Pre-2008 Version	1.17% ⁽¹⁾	1.97% ⁽¹⁾
	Investment options (Fund fees and expenses)		
	2008 Version	0.52% ⁽²⁾	1.74% ⁽²⁾
	Pre-2008 Version	0.43% ⁽²⁾	1.74% ⁽²⁾
	Optional benefits available for an additional charge (for a single optional benefit, if elected)	0.05% ⁽³⁾	1.50% ⁽⁴⁾
	Because your Contract is customizable, the choices you make affect how much you will pay. To help you understand the cost of owning your Contract, the following table shows the lowest and highest cost you could pay <i>each year</i> , based on current charges. This estimate assumes that you do not take withdrawals from the Contract, which could result in the assessment of CDSCs that substantially increase costs.		
Lowest Annual Cost:		Highest Annual Cost: ⁽⁵⁾	
2008 Version Contract: \$1,481		2008 Version Contract: \$4,663	
Pre-2008 Version Contract: \$1,407		Pre-2008 Version Contract: \$4,663	
Assumes: • Investment of \$100,000 • 5% annual appreciation • Least expensive combination of Fund fees and expenses • No optional benefits • No CDSC • No additional Purchase Payments, transfers, or withdrawals		Assumes: • Investment of \$100,000 • 5% annual appreciation • Most expensive combination of optional benefits and Fund fees and expenses • No CDSC • No additional Purchase Payments, transfers, or withdrawals	

(1) Represents the mortality and expense risk charge and administrative charge (charged as a percentage of average account value in the Separate Account on an annualized basis) and the annual contract maintenance charge (a fixed dollar amount that may be waived for certain Contract Value amounts) collected during the Contract Year that are attributable to the Contract divided by the total average net assets that are attributable to the Contract.

(2) As a percentage of Fund assets.

(3) This charge is the current charge for the least expensive optional benefit, the Nursing Home Waiver Benefit. In the first Contract Year, the charge is a percentage of your Purchase Payments. On the last day of your first Contract Year and on the last day of each Contract Year thereafter, the annual charge is a percentage of your Contract Value on that date.

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- (4) This charge is the current charge for the most expensive optional benefit, the MassMutual Guaranteed Income Plus 5 or 6 (GMIB 5 or GMIB 6). The charge is equal to, on an annual basis, a percentage of your GMIB value deducted quarterly in arrears while the feature is in effect.
- (5) The calculation of the highest annual cost assumes the election of the following optional features: GMIB 5 or GMIB 6, the Annual Ratchet Death Benefit, the 10%/20% Free Withdrawal Benefit, the Nursing Home Waiver Benefit and the Equalizer Benefit.

RISKS		LOCATION IN PROSPECTUS
Risk of Loss	<ul style="list-style-type: none"> You can lose money by investing in this Contract, including loss of principal. 	Principal Risks of Investing in the Contract
Not a Short-Term Investment	<ul style="list-style-type: none"> This Contract is not designed for short-term investing and is not appropriate for an investor who needs ready access to cash. CDSCs may apply for up to seven years (nine years if the optional nine year CDSC schedule is elected) following your Issue Date on amounts withdrawn that exceed the free withdrawal amount or when Contract Value is applied to Annuity Option E. If CDSCs apply, they will reduce the value of your Contract if you withdraw money during that time. The benefits of tax deferral also mean the Contract is more beneficial to investors with a long time horizon. 	Principal Risks of Investing in the Contract
Risks Associated with Investment Options	<ul style="list-style-type: none"> An investment in this Contract is subject to the risk of poor investment performance of the Funds you choose and can vary depending upon the performance of the funds available under the Contract. Each Fund has its own unique risks. You should review the prospectuses for the available Funds before making an investment decision. 	Principal Risks of Investing in the Contract
Insurance Company Risks	<ul style="list-style-type: none"> Any obligations (including under any fixed account investment option), guarantees, and benefits of the Contract are subject to the claims-paying ability of MassMutual. If MassMutual experiences financial distress, it may not be able to meet its obligations to you. More information about MassMutual, including its financial strength ratings, is available by request by calling (800) 272-2216 or by visiting www.MassMutual.com/ratings. 	Principal Risks of Investing in the Contract

RESTRICTIONS		LOCATION IN PROSPECTUS
Investments	<ul style="list-style-type: none"> Currently, there is no charge when you transfer Contract Value among Sub-Accounts. However, we reserve the right to charge \$20 per transfer in excess of 12 in a single calendar year. We reserve the right to remove or substitute Funds as investment options that are available under the Contract. We reserve the right to limit transfers if frequent or large transfers occur. 	General Information about Massachusetts Mutual Life Insurance Company, the Separate Account and the Investment Choices – The Funds Transfers and Transfer Programs – Limits on Frequent Trading and Market Timing Activity

	RESTRICTIONS	LOCATION IN PROSPECTUS
Optional Benefits	<ul style="list-style-type: none"> We limit the investment choices available if you are participating in any of the following optional benefits. This means you will be limited in your choice of Sub-Account investments and may be limited in how much you can invest in certain Sub-Accounts. This also means you will not be able to allocate Contract Value to all of the Sub-Accounts that are available to Owners who have not elected one of these optional benefits. We impose allocation restrictions to reduce the risk of investment losses that may require us to use our General Account assets to honor the guarantee under these optional benefits. We may change these restrictions in the future. <ul style="list-style-type: none"> MassMutual Lifetime Income Protector Guaranteed Minimum Accumulation Benefit Guaranteed Minimum Income Benefit MassMutual Lifetime Payment Plus Since we no longer offer this Contract for sale, you may no longer elect any additional optional benefits under this Contract. For certain optional benefits, withdrawals, including withdrawals that exceed limits specified by the terms of the optional benefit, may affect the availability of the benefit by reducing the benefit by an amount greater than the value withdrawn and/or could terminate the benefit. See “Additional Benefits – Guaranteed Minimum Accumulation Benefit Examples,” “Additional Benefits – Basic Guaranteed Minimum Income Benefit,” “Additional Benefits – MassMutual Lifetime Income Protector,” and “Additional Benefits – MassMutual Lifetime Payment Plus.” If you are participating in the Guaranteed Minimum Accumulation Benefit, Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus, or MassMutual Lifetime Income Protector, you may not participate in the Separate Account Dollar Cost Averaging Program, Automatic Rebalancing Program, Interest Sweep Option, or any fixed account. If you are participating in MassMutual Lifetime Income Protector, the Guaranteed Minimum Accumulation Benefit, the Guaranteed Minimum Income Benefit, or MassMutual Lifetime Payment Plus and elected a Directed Allocation Model, the Custom Allocation Choice program or the Custom Allocation Choice Select program, you agree to authorize us to automatically rebalance your Contract Value among the Sub-Accounts available under the Program on a periodic basis to continue to follow the Custom Allocation Choice program or Custom Allocation Choice Select program investment parameters. You cannot elect the Annual Ratchet Death Benefit if you are participating in the MassMutual Lifetime Income Protector. You may only participate in one death benefit at a time. Some optional features are not available if you are a certain Age. 	<p>Additional Benefits – Additional Death Benefit Features</p> <p>Additional Benefits – Guaranteed Minimum Accumulation Benefit (GMAB)</p> <p>Additional Benefits – Guaranteed Minimum Income Benefit (GMIB)</p> <p>Additional Benefits – MassMutual Lifetime Income ProtectorSM</p> <p>Additional Benefits – MassMutual Lifetime Payment PlusSM</p>

TAXES		LOCATION IN PROSPECTUS
Tax Implications	<ul style="list-style-type: none"> You should consult with a tax professional to determine the tax implications of an investment in and payments received under the Contract. If you purchase the Contract through a qualified retirement plan or individual retirement annuity (IRA), you do not receive any additional tax deferral. Earnings on your Contract are taxed at ordinary income tax rates when you withdraw them, and you may have to pay an additional income tax if you take a withdrawal before age 59½. Earnings for this purpose consist of Contract Value in excess of your after-tax investment in the Contract. 	Taxes
CONFLICTS OF INTEREST		LOCATION IN PROSPECTUS
Investment Professional Compensation	<ul style="list-style-type: none"> Your registered representative may have received compensation, in the form of commissions, for selling this Contract to you. If your registered representative is also a MassMutual insurance agent, they are also eligible for certain cash and non-cash benefits from MassMutual. Cash compensation includes bonuses and allowances based on factors such as sales, productivity and persistency (contract retention). Non-cash compensation includes various recognition items such as prizes and awards as well as attendance at, and payment of the costs associated with attendance at, conferences, seminars and recognition trips, and also includes contributions to certain individual plans such as pension and medical plans. Sales of the Contract may have helped these registered representatives and their supervisors qualify for such benefits. This conflict of interest may have influenced your registered representative to offer or recommend this Contract over another investment. 	Distribution
Exchanges	<ul style="list-style-type: none"> Because the Contract is no longer sold, you would not be affected by a scenario in which you are asked to replace an existing annuity contract you own with a new purchase of this Contract. However, in general you should be aware that some investment professionals may have a financial incentive to offer you a new contract in place of the one you already own. Thus, in general, you should only exchange your annuity contract if you determine, after comparing the features, fees, and risks of both contracts, that it is preferable for you to purchase the new annuity rather than continue to own the existing annuity. 	N/A

Overview of the Contract

What is this Contract, and what is it designed to do? The MassMutual Transitions Select Variable Annuity is designed to enable you to accumulate assets through investments in one or more of the variable investment divisions (Sub-Accounts) of the Massachusetts Mutual Variable Annuity Separate Account 4 (Separate Account) and various fixed account options. The Contract can supplement your retirement income by providing a stream of income during the Income Phase. Before you begin receiving Annuity Payments, the Contract also provides a death benefit for your designated beneficiaries. The Contract may be appropriate if you have a long term investment horizon. It is not intended for people who need to take early or frequent withdrawals or who intend to engage in frequent trading among the Sub-Accounts of the Separate Account.

We no longer sell the Contract. However, we continue to administer existing Contracts.

How do I accumulate assets in the Contract and receive income from the Contract? The Contract has two phases: 1) the Accumulation Phase and 2) the Income Phase.

A list of the Funds in which you may invest is provided at the back of this Prospectus. See “Appendix A – Funds Available Under the Contract.”

- **Accumulation Phase**

During the Accumulation Phase, subject to certain restrictions, you may apply Purchase Payments to the Contract and allocate the Purchase Payments among:

the Sub-Accounts of the Separate Account, each of which invests in a mutual fund (Fund), with each Fund having its own investment strategy, investment adviser, expense ratio and returns, and

the DCA Fixed Account for a scheduled term of six, twelve, or eighteen months, to the Long-Term Guarantee Fixed Accounts, or to The Fixed Account. Assets allocated to the DCA Fixed Accounts are credited with a fixed rate of interest and are systematically transferred to Sub-Accounts that you select. Assets allocated to the Long-Term Guaranteed Fixed Accounts are credited with a specific rate of interest for a specific guaranteed period. Assets allocated to The Fixed Account are credited with a specified rate that we declare in advance.

- **Income Phase**

During the Income Phase, you may receive fixed and/or variable Annuity Payments under the Contract by applying your Contract Value to a payment option. Depending on the payment option you select, payments may continue for the life of one or two Annuitants or for a specified period between 10 and 30 years.

When you elect to receive Annuity Payments, the Contract Value is applied to an Annuity Option and you may no longer be able to withdraw money from that portion of the Contract. If you apply your full Contract Value to an Annuity Option, the Accumulation Phase will end, and the death benefit and any other optional benefit will terminate.

You may elect to apply part of the Contract Value from your Non-Qualified Contract to an Annuity Option instead of your full Contract Value. If you elect to apply a portion of your Contract Value to an Annuity Option, the amount applied will be treated as a withdrawal for purposes of calculating the Contract Value and the value of any optional features in effect. If you choose to apply part of your Contract Value to an Annuity Option, it may have adverse tax consequences.

What are the primary features and options that the MassMutual Transitions Select Variable Annuity offers?

- **Contract Versions.** There are two versions of the MassMutual Transitions Select Variable Annuity:
 - the 2008 Version (Contracts applied for on or after 9/8/2008, subject to state availability); and
 - the Pre-2008 Version (Contracts applied for prior to 9/8/2008 or in states where the 2008 Version was unavailable).

Expenses for funds offered in the 2008 Version are generally higher than the expenses for the funds offered in the Pre-2008 Version. The primary differences are disclosed in Appendix A.

- **Accessing your money.** During the Accumulation Phase, you may make a partial or full withdrawal of your Contract Value by submitting a partial withdrawal form or full withdrawal form acceptable to us in Good Order to our Service Center. You may also submit the requests by other means that we authorize, such as email, telephone or fax. Contact our Service Center for details.

All withdrawals are subject to the limitations described in the prospectus. Withdrawal rights during the Annuity Period will depend on the Annuity Option selected.

- **Tax treatment.** You may transfer Contract Value among Sub-Accounts without tax implications, and earnings (if any) on your investments are generally tax-deferred. You are generally taxed only when (1) you make a partial or full withdrawal; (2) you receive an Annuity Payment under the Contract; or (3) upon payment of the death benefit.
- **Death Benefit.** Your Contract includes multiple death benefit options. See “Death Benefit” and “Additional Benefits – Additional Death Benefit Features.”

Once the Income Phase commences, payments upon death may be available to Beneficiaries depending upon the Annuity Option elected.

- **Optional Benefits.** We offered several optional benefits that could have been added to the Contract for either an additional charge or a credit. These benefits are more fully described in the “Additional Benefits” section of this prospectus. Please keep in mind, once you have selected an optional benefit, your ability to select a different option may be limited.
- **Additional Benefits and Services.** We make certain additional services available under the Contract at no additional charge:

The Separate Account Dollar Cost Averaging Program allows you to transfer a set amount from a Sub-Account to any other Sub-Account on a regular schedule.

The Automatic Rebalancing Program automatically rebalances your Contract Value among your selected Sub-Accounts in order to restore your allocation to the original level.

The Interest Sweep Option automatically transfers earnings from your Contract Value in The Fixed Account to any one Sub-Account or combination of Sub-Accounts that you select.

You may participate only in one of the following programs at a time: Separate Account Dollar Cost Averaging Program, Automatic Rebalancing Program, or Interest Sweep Option. You may not participate in these programs if you have a current election of the DCA Fixed Account, an Asset Allocation Program, Guaranteed Minimum Accumulation Benefit, Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus, or MassMutual Lifetime Income Protector. We do not charge for participation in these programs.

The Systematic Withdrawal Program allows you to set up automatic periodic withdrawals from your Contract Value. We will take any withdrawal under this Program proportionally from your Contract Value in your selected investment choices.

Certain Owners may elect to allocate their Contract Value to the Custom Allocation Choice asset allocation program which requires investing within the minimum and maximum parameters allowed for each style of investment choice and periodic rebalancing of Contract Value.

The prospectus and Statement of Additional Information (SAI) describe all material terms and features of your Contract. Certain non-material provisions of your Contract may be different than the general description in the prospectus and the SAI, and certain riders may not be available because of legal requirements in your state. Any such state variations will be included in your Contract or in riders or endorsements attached to your Contract. See your Contract for specific variations. Also see “Appendix Q – State Variations of Certain Contract Features.”

Additional Information about Fees

The following tables describe the fees and expenses you pay when buying, owning, and surrendering or making withdrawals from the Contract. Please refer to your Contract specifications page(s) for information about the specific fees you will pay each year based on the options you have elected.

The first table describes the fees and expenses that you will pay at the time that you buy the Contract, surrender or make withdrawals from the Contract, or transfer Contract Value between investment options. State Premium Taxes may also be deducted.

Transaction Expenses	Maximum	Current
Contingent Deferred Sales Charge (CDSC)⁽¹⁾		
Standard ⁽²⁾	7%	7%
Optional Nine Year (credit provided if elected) ⁽³⁾	8%	8%
 <i>(1) The CDSC percentage charge is based on the length of time between when we issued your Contract and when you make a withdrawal or apply a portion or all of your Contract Value to Annuity Option E.</i>		
<i>(2) The CDSC percentage decreases over time in the following manner: 7% (for first three years), 6% (for 4th year), 5% (for 5th year), 4% (for 6th year), 3% (for 7th year), and 0% (for 8th year and later). See "Charges and Deductions – Contingent Deferred Sales Charge" for more information.</i>		
<i>(3) The Optional Nine Year Contingent Deferred Sale Charges decreases over time in the following manner: 8% (for first two years), 7% (for 3rd year), 6% (in 4th year), 5% (in 5th year), 4% (in 6th year), 3% (in 7th year), 2% (in 8th year), 1% (in 9th year), and 0% (in 10th year or later). See "Charges and Deductions – Contingent Deferred Sales Charge" for more information.</i>		
Transfer Fee During the Accumulation Phase	\$20 per transfer for each additional transfer in excess of the 12 free transfers per calendar year	\$0

The next table describes fees and expenses you will pay *each year* during the time you own the Contract, not including underlying Fund fees and expenses.

If you choose to purchase an optional benefit, you will pay additional charges, as shown below.

Annual Contract Expenses	Maximum	Current
Administrative Expenses	\$60 per Contract Year ⁽¹⁾	\$40 per Contract Year ⁽¹⁾
Base Contract Expenses (as a percentage of average account value)	1.95% ⁽²⁾	1.15% ⁽²⁾
Optional Benefit Expenses		
MassMutual Lifetime Income Protector	1.95% of Current Income Base	0.95% of Current Income Base
Annual Ratchet Death Benefit	0.90% of Contract Value	0.40% of Contract Value
Guaranteed Minimum Accumulation Benefit⁽³⁾		
For Contracts issued on or after 5/1/10	1.00% of Contract Value	0.95% of Contract Value
For Contracts issued on or after 9/1/06 and prior to 5/1/10	1.00% of Contract Value	0.45% of Contract Value
For Contracts issued prior to 9/1/2006	1.00% of Contract Value	0.35% of Contract Value
10%/20% Free Withdrawal Feature⁽³⁾	0.35% of Contract Value	0.25% of Contract Value
Nursing Home Waiver Benefit⁽³⁾	0.10% of Contract Value	0.05% of Contract Value
MassMutual Guaranteed Income Plus 5 (2008 and Pre-2008 Versions "GMIB 5")	1.50% of Current GMIB Value	1.50% of Current GMIB Value
MassMutual Guaranteed Income Plus 6 (2008 and Pre-2008 Versions "GMIB 6")	1.50% of Current GMIB Value	1.50% of Current GMIB Value
Basic GMIB⁽³⁾	1.25% of Contract Value	0.60% of Contract Value
MassMutual Lifetime Payment Plus		
Single Life	1.50% of Current Benefit Base	0.60% of Current Benefit Base
Joint Life	1.50% of Current Benefit Base	0.85% of Current Benefit Base
Equalizer Benefit⁽³⁾	0.60% of Contract Value	0.50% of Contract Value

(1) This represents the annual contract maintenance charge. Currently, we waive this charge if, when we are to make the deduction, your Contract Value is \$100,000 or more. We assess the charge on each Contract Anniversary and when you make a withdrawal of your entire Contract Value or apply your entire Contract Value to an Annuity Option if that does not occur on a Contract Anniversary. During the Annuity Period, the annual contract maintenance charge will be deducted pro-rata from Annuity Payments and will result in a reduction of each Annuity Payment.

(2) The Base Contract Expenses represent the sum of the mortality and expense risk charge and the administrative charge. The current mortality and expense risk charge is 1.00% annually and the current administrative charge is 0.15% annually. The maximum mortality and expense risk charge is 1.70% annually and the maximum administrative charge is 0.25% annually. These charges are a percentage of average account value in the Separate Account on an annualized basis.

(3) In the first Contract Year, the charge is a percentage of your Purchase Payments. On the last day of your first Contract Year and on the last day of each Contract Year thereafter, the annual charge is a percentage of your Contract Value on that date.

The next item shows the minimum and maximum total operating expenses charged by the Funds that you may pay periodically during the time that you own the Contract. A complete list of Funds available under the Contract, including their annual expenses, may be found in Appendix A.

Annual Fund Operating Expenses

2008 Version: for Contracts applied for on or after 9/8/2008, subject to state availability

Charge	Minimum	Maximum
Range of annual Fund operating expenses (including management fees, distribution and/or service (12b-1) fees and other expenses). ⁽¹⁾	0.52%	1.74%

⁽¹⁾ The Fund expenses used to prepare this item were provided to us by the Funds. We have not independently verified such information provided to us by Funds that are not affiliated with us.

Pre-2008 Version: for Contracts applied for prior to 9/8/2008 or in states where the 2008 Version was unavailable

Charge	Minimum	Maximum
Range of annual Fund operating expenses (including management fees, distribution and/or service (12b-1) fees and other expenses). ⁽¹⁾	0.43%	1.74%

⁽¹⁾ The Fund expenses used to prepare this item were provided to us by the Funds. We have not independently verified such information provided to us by Funds that are not affiliated with us.

The information above describes the fees and expenses you pay related to the Contract. For information on compensation we may receive from the Funds and their advisers and sub-advisers, see "General Information about Massachusetts Mutual Life Insurance Company, the Separate Account and the Investment Choices – Compensation We Receive from Funds, Advisers and Sub-Advisers." For information on compensation we pay to broker-dealers selling the Contract, see "Distribution."

Examples Using Current and Maximum Expenses

These Examples are intended to help you compare the cost of investing in the Contract with the cost of investing in other variable annuity contracts. These costs include transaction expenses, annual Contract fees, and Fund fees and expenses.

Example I assumes that you withdraw all your Contract Value at the end of each year shown.

Example II assumes you do not withdraw any Contract Value at the end of each year shown, or that you decide to begin the Income Phase at the end of each year shown and we do not deduct a CDSC. Currently the Income Phase is not available until five years (13 months for Contracts issued in New York and Florida) after you purchase your Contract.

Both Example I and Example II assume:

- that your Contract is the 2008 Version,
- that you invest \$100,000 in the Contract for the time periods indicated,
- that you allocate it to a Sub-Account that has a 5% gross return each year,
- that you elected the 10%/20% Free Withdrawal Feature, the Nursing Home Waiver Benefit, the Annual Ratchet Death Benefit and the Guaranteed Minimum Accumulation Benefit,
- that either the current or maximum fees and expenses in the "Table of Fees and Expenses" apply (including total Separate Account annual expenses of 1.15% for current fees and expenses and 1.95% for maximum fees and expenses), and
- that you selected one of two Sub-Accounts:
 - the one that invests in the Asset Allocation Fund with the highest operating expenses; or
 - the one that invests in the Asset Allocation Fund with the lowest operating expenses.

Examples Using Maximum Expenses

Based on the above assumptions, your costs would be as shown in the following table. Your actual costs may be higher or lower.

Years	Example I				Example II			
	1	3	5	10	1	3	5	10
Sub-Account with highest operating expenses (assumes investment in the Asset Allocation Fund with the highest operating expenses)	\$11,691	\$21,716	\$30,786	\$53,187	\$5,420	\$16,192	\$26,873	\$53,187
Sub-Account with lowest operating expenses (assumes investment in the Asset Allocation Fund with the lowest operating expenses)	\$11,579	\$21,398	\$30,279	\$52,290	\$5,300	\$15,852	\$26,341	\$52,290

Examples Using Current Expenses

Based on the above assumptions, your costs would be as shown in the following table. Your actual costs may be higher or lower.

Years	Example I				Example II			
	1	3	5	10	1	3	5	10
Sub-Account with highest operating expenses (assumes investment in the Asset Allocation Fund with the highest operating expenses)	\$10,286	\$17,659	\$24,215	\$41,075	\$3,910	\$11,858	\$19,981	\$41,075
Sub-Account with lowest operating expenses (assumes investment in the Asset Allocation Fund with the lowest operating expenses)	\$10,184	\$17,359	\$23,720	\$40,119	\$3,800	\$11,537	\$19,462	\$40,119

We estimate that the annual contract maintenance charge under the current expenses and maximum expenses would be \$0 or, as percentage, 0.00%.

The examples do not reflect any Premium Taxes. However, Premium Taxes may apply.

There is information concerning compensation payments we make to sales representatives in connection with the sale of the Contracts in "Other Information – Distribution."

The examples should not be considered a representation of past or future expenses. Your actual expenses may be higher or lower than those shown in the examples. The assumed 5% annual rate of return is purely hypothetical. Actual returns may be greater or less than the assumed hypothetical return.

Principal Risks of Investing in the Contract

There are risks associated with investing in the Contract. You can lose money in a variable annuity, including potential loss of your original investment. The value of your investment and any returns will depend on the performance of the Funds you select. Each Fund may have its own unique risks. You bear the risk of any decline in your Contract Value resulting from the poor performance of the Funds you have selected.

Variable annuities are not a short-term investment vehicle. The CDSC may apply for a number of years, so the Contract should only be purchased for the long-term. Under some circumstances, you may receive less than the sum of your Purchase Payments. In addition, full or partial withdrawals will be subject to income tax to the extent that they consist of earnings and may be subject to a 10% additional income tax if taken before age 59½. Accordingly, you should carefully consider your income and liquidity needs before purchasing a Contract. Additional information about these risks appear in “Important Information You Should Consider About the MassMutual Transitions Select Variable Annuity,” “Withdrawals,” and “Taxes.”

Investment Risk. You bear the risk of any decline in the Contract Value caused by the performance of the Funds held by the Sub-Accounts. Those Funds could decline in value very significantly, and there is a risk of loss of your entire amount invested. The risk of loss varies with each Fund. The investment risks are described in the prospectuses for the Funds.

Investment Restrictions – Opportunity Risks. The optional GMAB, GMIB, MassMutual Lifetime Income Protector, and MassMutual Lifetime Payment Plus benefits restrict your choice of available Funds. These restrictions are intended to protect us financially, in that they reduce the likelihood that we will have to pay guaranteed benefits under the rider from our own assets. These restrictions could result in an opportunity cost – in the form of Funds that you did not invest in that ultimately might generate superior investment performance. Thus, you should consider these restrictions when deciding whether to elect the one of these benefits.

Risk Associated With Election of:

- **GMAB** – This feature includes several requirements that must be adhered to in order to preserve and maximize the guarantees we offer under this benefit. If you fail to adhere to these requirements, that may diminish the value of the benefit and even possibly cause termination of the benefit. In addition, it is possible that you will pay fees for the GMAB without receiving a GMAB credit at the end of the benefit period. Any withdrawal will negatively impact your GMAB Value. Any Purchase Payments made after the second Contract Year or after any applicable reset will increase your Contract Value, but will not increase your GMAB Value.
- **GMIB** – The Basic GMIB and MassMutual Guaranteed Income Plus 5 and 6 benefits include several requirements that must be adhered to in order to preserve and maximize the guarantees we offer under these benefits. If you fail to adhere to these requirements, that may diminish the value of the benefits and even possibly cause termination of the benefits. In addition, if you decide to not apply your GMIB Value to an Annuity Option you may not receive the full value of these benefits. For the Basic GMIB, any Purchase Payments made after the second Contract Year will not increase the GMIB value. In addition, any withdrawal will reduce and may eliminate the value of the guarantees provided by this feature. For MassMutual Guaranteed Income Plus 5 and 6, any Purchase Payments made after the second Contract Year if the GMIB value has not been reset, or after the most recent reset of the GMIB, will not increase the GMIB value. In addition, any excess withdrawal will reduce and may eliminate the value of the guarantees provided by this feature.
- **MassMutual Lifetime Payment Plus** – This feature includes several requirements that must be adhered to in order to preserve and maximize the guarantees we offer under this benefit. If you fail to adhere to these requirements, that may diminish the value of the benefit and even possibly cause termination of the benefit. Postponing withdrawals may positively impact the benefit base. However, if you postpone the taking of withdrawals, you may limit the value of this feature because your remaining life expectancy shortens as you age. Excess withdrawals may significantly reduce or eliminate the value of the guarantees provided by this feature. Excess withdrawals are those in excess of the Guaranteed Lifetime Withdrawal Amount or, if taken prior to the youngest covered person reaching Age 60, excess withdrawals are those in excess of the Guaranteed Withdrawal Amount.
- **MassMutual Lifetime Income Protector** – This feature includes several requirements that must be adhered to in order to preserve and maximize the guarantees we offer under this benefit. If you fail to adhere to these requirements, that may diminish the value of the benefit and even possibly cause termination of the benefit. You should not elect MassMutual Lifetime Income Protector if you have a need to take withdrawals, including RMDs, before the income eligibility date, because early withdrawals have a negative impact on the feature. After the income eligibility date, excess withdrawals will reduce and may eliminate the value of the guarantees provided by MassMutual Lifetime Income Protector. Additional Purchase Payments after the second Contract Year will not increase the value of the guarantees provided by this feature.

Insurance Company Insolvency. It is possible that we could experience financial difficulty in the future and even become insolvent, and therefore unable to provide all of the guarantees and benefits that we promise that exceed the value of the assets in the Separate Account. Similarly, if we experience financial difficulty, it could interfere with our ability to fulfill our obligations under The Fixed Accounts and other General Account obligations.

Tax Consequences. Withdrawals are generally taxable to the extent of any earnings in the Contract, and prior to age 59½ an additional income tax may apply. In addition, even if the Contract is held for years before any withdrawal is made, withdrawals are taxable as ordinary income rather than capital gains. Earnings for this purpose consist of Contract Value in excess of your after-tax investment in the Contract.

Cybersecurity and Certain Business Continuity Risks. Our operations support complex transactions and are highly dependent on the proper functioning of information technology and communication systems. Any failure of or gap in the systems and processes necessary to support complex transactions and avoid systems failure, fraud, information security failures, processing errors, cyber intrusion, loss of data and breaches of regulation may lead to a materially adverse effect on our results of operations and corporate reputation. In addition, we must commit significant resources to maintain and enhance our existing systems in order to keep pace with applicable regulatory requirements, industry standards and customer preferences. If we fail to maintain secure and well-functioning information systems, we may not be able to rely on information for product pricing, compliance obligations, risk management and underwriting decisions. In addition, we cannot assure investors or consumers that interruptions, failures or breaches in security of these processes and systems will not occur, or if they do occur, that they can be timely detected and remediated. The occurrence of any of these events may have a materially adverse effect on our businesses, results of operations and financial condition.

For additional detail regarding cybersecurity and related risks, please see “Other Information – Computer System, Cybersecurity, and Service Disruption Risks” in this prospectus.

General Information about Massachusetts Mutual Life Insurance Company, the Separate Account and the Investment Choices

The Company

MassMutual and its domestic life insurance subsidiaries provide individual and group life insurance, disability insurance, individual and group annuities and guaranteed interest contracts to individual and institutional customers in all 50 states of the U.S., the District of Columbia and Puerto Rico. Products and services are offered primarily through MassMutual's distribution channels: MassMutual Financial Advisors, MassMutual Strategic Distributors, Institutional Solutions and Worksite.

MassMutual is organized as a mutual life insurance company. MassMutual's home office is located at 1295 State Street, Springfield, Massachusetts 01111-0001.

Financial Condition of the Company

We use General Account assets for many purposes, including to pay death benefits, Annuity Payments, withdrawals and transfers from fixed account investment choices and to pay amounts we provide to you through any elected additional feature that are in excess of your Contract Value allocated to the Separate Account. Any amounts that we may be obligated to pay under the Contract in excess of Contract Value are subject to our financial strength and claims-paying ability and our long-term ability to make such payments. The assets of the Separate Account, however, are also available to cover the liabilities of our General Account, but only to the extent they exceed our liabilities under the Contract and other contracts we issue that are funded by the Separate Account.

We issue other types of insurance policies and financial products as well, and we pay our obligations under those products from our assets in the General Account.

As an insurance company, we are required by state insurance regulation to hold a specified amount of reserves in order to meet the contractual obligations of our General Account to our insurance policies and financial products. We monitor our reserves so that we hold sufficient amounts to cover actual or expected Contract and claims payments. In addition, we hedge our investments in our General Account and may require that purchasers of certain of our variable insurance products allocate Purchase Payments and Contract Value according to specified investment requirements. Even with these safeguards in place, there are risks to purchasing any insurance product and there is no guarantee that we will always be able to meet our claims-paying obligations.

State insurance regulators also require insurance companies to maintain a minimum amount of capital, which acts as a cushion if the insurer suffers a financial setback because of the inherent risks in the insurer's operations. These risks include losses that we may incur as the result of defaults on the payment of interest or principal on our General Account assets – e.g., bonds, mortgages, general real estate investments, and stocks – as well as the loss in market value of these investments.

We continue to evaluate our investment portfolio to mitigate market risk and actively manage the investment in that portfolio.

The MassMutual financial information in the SAI includes a more detailed discussion of the risks inherent in our General Account assets. We encourage both existing and prospective Owners to read and understand our financial statements.

The Separate Account

We established Massachusetts Mutual Variable Annuity Separate Account 4 (Separate Account) as a separate account under Massachusetts law on July 9, 1997. The Separate Account is registered with the SEC as a unit investment trust under the 1940 Act.

The Separate Account holds the assets that underlie the Contracts (and certain other contracts that we issue), except any assets allocated to our General Account. We keep the Separate Account assets separate from the assets of our General Account and other separate accounts. The Separate Account is divided into Sub-Accounts, each of which invests exclusively in a single Fund.

We own the assets of the Separate Account. We credit gains to, or charge losses against, the Separate Account, whether or not realized, without regard to the performance of other investment accounts. The Separate Account's assets may not be used to pay any of our liabilities other than those arising from the Contracts (or other contracts that we issue and that are funded by the Separate Account). If the Separate Account's assets exceed the required reserves and other liabilities, we may transfer the excess to our General Account. The obligations of the Separate Account are not our generalized obligations and will be satisfied solely by the assets of the Separate Account. We are obligated to pay all amounts promised to investors under the Contract.

We reserve the right, subject to compliance with applicable federal securities laws and regulations and any other federal or state law, to make certain changes to the structure and operation of the Separate Account, including, among other things:

- eliminate, combine or add Sub-Accounts;
- combine the Separate Account or any Sub-Account(s) with one or more different separate account(s) or Sub-Account(s);
- close existing Sub-Accounts to allocations of new Purchase Payments and Contract Value by current or new Owners;
- transfer assets of the Separate Account or any Sub-Account that we may determine to be associated with the class of contracts in which the Contract belongs to another separate account or Sub-Account;
- operate the Separate Account as a management investment company under the 1940 Act, or as any other form permitted by law;
- add or remove Funds or Fund classes in which the Sub-Accounts invest; and
- substitute a new Fund for a Fund in which a Sub-Account currently invests (new or substitute Funds may have different fees and expenses).

In the event we exercise these rights, we will provide Written Notice to the Owner(s).

The Fixed Accounts

In most states, we offer the following fixed accounts (collectively, “The Fixed Accounts”) as investment choices:

- Fixed Accounts for Dollar Cost Averaging (the “DCA Fixed Accounts”);
- Fixed Accounts with a Long-Term Guarantee (the “Long-Term Guarantee Fixed Accounts”); and
- The Fixed Account.

The Fixed Accounts are investment choices within our General Account. Purchase Payments allocated to The Fixed Accounts and transfers to The Fixed Accounts become part of our General Account which supports insurance and annuity obligations.

See “Appendix Q – State Variations of Certain Contract Features.”

The DCA Fixed Accounts

Each DCA Fixed Account is a fixed account from which assets are systematically transferred to any Fund(s) you select. You may not transfer your Contract Value in a DCA Fixed Account to The Fixed Accounts. During the Accumulation Phase, you may choose to have your Purchase Payments allocated to a DCA Fixed Account for the period of the DCA Fixed Account Term (DCA Term). Your election must be in writing.

DCA Term

In most states, you have a choice of three DCA Fixed Accounts: (a) DCA Fixed Account with a DCA Term of six months; (b) DCA Fixed Account with a DCA Term of 12 months; or (c) DCA Fixed Account with a DCA Term of 18 months. See “Appendix Q – State Variations of Certain Contract Features.” You can only participate in one DCA Fixed Account at a time.

To the extent permitted by law, we reserve the right to change the duration of the DCA Terms in the future. Your DCA Term will terminate upon payment of the death benefit.

If you elect to make an allocation to a DCA Fixed Account, but your Annuity Date will occur prior to the end of that DCA Term, your DCA Term will expire early. It will expire on your Annuity Date. We will transfer any Contract Value remaining in the DCA Fixed Account on your Annuity Date in accordance with your DCA Fixed Account transfer instructions in effect at that time. No amounts will remain in the DCA Fixed Account after your Annuity Date.

How to Participate in the DCA Fixed Account

To participate in the DCA Fixed Account you must apply a new Purchase Payment of \$5,000 or greater to a DCA Term or provide us with evidence satisfactory to us that you will apply \$5,000 or more to a DCA Term via transfer(s) from another financial institution. Purchase Payments which originate from an annuity contract issued by us or certain of our affiliates cannot be allocated to a DCA Fixed Account. We reserve the right to reject Purchase Payments. You cannot transfer current Contract Value into the DCA Fixed Account. The first DCA transfer will occur five Business Days after we receive all or a portion of the Purchase Payment into the DCA Fixed Account.

You may apply additional Purchase Payments to the current DCA Term. Those additional Purchase Payments will be added to the amount in the current DCA Term and will participate only in the remaining period of the current DCA Term.

DCA Transfers

We make scheduled monthly transfers from the DCA Fixed Account. The first transfer will occur five Business Days after we receive your payment allocated to the DCA Fixed Account and a completed DCA Fixed Account election form. You may make a one-time transfer of your remaining Contract Value in the DCA Fixed Account into any of the Fund(s) prior to the expiration of your DCA Term. Your transfer will be effective on the Business Day we receive, in Good Order, your Written Request or telephone request at our Service Center. Our Business Day closes when the NYSE closes, usually 4:00 p.m. Eastern Time. If we receive your transfer request in Good Order at our Service Center on a Non-Business Day or after our Business Day closes, your transfer request will be effective on the next Business Day.

DCA Withdrawals

If you withdraw all or a portion of your Contract Value during a DCA Term, we will apply our normal withdrawal provisions.

DCA Fees

We reserve the right to assess a fee for processing transactions under the DCA Fixed Account.

DCA Interest Rate

We periodically set the interest rate we credit to the DCA Fixed Account. We will credit an interest rate at a rate not less than the minimum allowed by state law at the time we issue your Contract. We reserve the right to change the guaranteed minimum interest rate for newly issued Contracts, subject to applicable state law. The interest rate you will receive for the entire DCA Term is the interest rate in effect on the date your DCA Term begins. We guarantee the interest rate for the full DCA Term.

Additional Restrictions

If you are participating in a DCA Fixed Account, you cannot also participate in an Asset Allocation Program, the Automatic Rebalancing Program, the Interest Sweep Option, the Separate Account Dollar Cost Averaging Program, a Guaranteed Minimum Accumulation Benefit, a Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus or MassMutual Lifetime Income Protector.

Long-Term Guarantee Fixed Accounts

Each Long-Term Guarantee Fixed Account is a fixed account that is a part of the Company's General Account. During the Accumulation Phase, you may elect to have a Purchase Payment or transfer allocated to a Long-Term Guarantee Fixed Account. Your election must be in writing.

Allocating Purchase Payments

For Contracts issued after December 30, 2011, you may allocate up to 50% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts (unless your Contract was issued in Oregon). For Contracts issued after October 25, 2012 in Oregon, you may allocate up to 50% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts.

For Contracts issued on or before December 30, 2011, you may allocate up to 70% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts (unless your Contract was issued in Oregon). For Contracts issued on or before October 25, 2012 in Oregon, you may allocate up to 70% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts.

Some states have different allocation limits. See "Appendix Q – State Variations of Certain Contract Features."

If you are participating in a Guaranteed Minimum Accumulation Benefit, a Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus or MassMutual Lifetime Income Protector, you cannot make allocations to the Long-Term Guarantee Fixed Accounts. We reserve the right, upon providing you with 30 days advance notice, to change the percentage allowed, or to disallow completely the allocation of Purchase Payments to the Long-Term Guarantee Fixed Accounts. We will only exercise our right to discontinue access to the Long-Term Guarantee Fixed Accounts if the yield on investments will not support the guaranteed minimum

interest rate. The guaranteed minimum interest rate is the minimum rate allowed by state law as of the date we issue your Contract. Additionally, we will not exercise this right in an unfairly discriminatory manner.

We will only accept a Purchase Payment to a Long-Term Guarantee Fixed Account as of the beginning of a guarantee period. The minimum Purchase Payment amount we permit to any of the Long-Term Guarantee Fixed Accounts is \$1,000.

Transfers into a Long-Term Guarantee Fixed Account

We will only accept a transfer into a Long-Term Guarantee Fixed Account as of the beginning of a guarantee period. The minimum transfer amount we permit into any of the Long-Term Guarantee Fixed Accounts is \$1,000. For additional rules limiting your ability to transfer Contract Value into the Long-Term Guarantee Fixed Accounts, see "Transfers and Transfer Programs."

Transfers out of a Long-Term Guarantee Fixed Account

You may only transfer Contract Value out of a Long-Term Guarantee Fixed Account during the window period. The window period is the last 15 calendar days of a guarantee period and the first 15 calendar days of the immediately following guarantee period. For additional rules limiting your ability to transfer Contract Value out of the Long-Term Guarantee Fixed Accounts, see "Transfers and Transfer Programs."

Withdrawals and the Interest Rate Factor Adjustment

If you make a partial withdrawal, we will take the withdrawal amount proportionally from your Contract Value in your investment choices as of the Business Day we receive your request in Good Order at our Service Center. Except during the window period, we will apply an interest rate factor adjustment to any partial or full withdrawal of Contract Value from a Long-Term Guarantee Fixed Account. Any withdrawal of Contract Value may also be subject to a CDSC even if the withdrawal occurs during the window period. We will apply the interest rate factor adjustment prior to assessing a CDSC. **The interest rate factor adjustment may increase or decrease your Contract Value.**

We will waive a negative interest rate factor adjustment if:

- the withdrawal is taken as part of our Required Minimum Distribution (RMD) program;
- the RMD amount is calculated using only the assets held under this contract;
- the RMD is for the current calendar year; and
- in that Contract Year, RMD withdrawals for only a single calendar year are taken.

See "Appendix C – Long-Term Guarantee Fixed Account Interest Rate Factor Adjustment Calculation" for the formula used to calculate the interest rate factor adjustment.

Rate of Interest

Each Long-Term Guarantee Fixed Account guarantees that we will credit your value in that fixed account with a specific rate of interest for a specific guarantee period. We may offer various Long-Term Guarantee Fixed Account guarantee periods. The guarantee period for a Long-Term Guarantee Fixed Account begins on the date we apply your Purchase Payment or transferred Contract Value to that account, and ends on the last day of the guarantee period. Amounts you allocate or transfer to any Long-Term Guarantee Fixed Account earn interest at the guaranteed rate applicable to that Long-Term Guarantee Fixed Account on the date we credit the amount to that account. The interest rate we credit remains constant during a Long-Term Guarantee Fixed Account guarantee period. You may allocate amounts to multiple Long-Term Guarantee Fixed Accounts. We may change the terms of the Long-Term Guarantee Fixed Accounts at any time. We will credit an interest rate at a rate not less than the minimum allowed by state law at the time we issue your Contract. We reserve the right to change the guaranteed minimum interest rate for newly issued Contracts, subject to applicable state law.

Renewal Options

We will notify you in writing regarding your renewal options prior to the last day of a guarantee period. If we receive a Written Request in Good Order at our Service Center at least three Business Days prior to the last day of a guarantee period, you may elect a renewal guarantee period from any of the guarantee periods that we are currently offering at that time to new Owners. Alternatively, you may transfer your Contract Value in the Long-Term Guarantee Fixed Accounts to another investment choice. If you have not elected otherwise by Written Request sent in Good Order to our Service Center, we will automatically invest your Contract Value in a Long-Term Guarantee Fixed Account as of the last day of the guarantee period in a Long-Term Guarantee Fixed Account with the same guarantee period as the immediately preceding guarantee period. If we are not offering a guarantee period for the same length of

time as your guarantee period just ended, we will invest your Contract Value in a Long-Term Guarantee Fixed Account with the next shorter guarantee period being offered by us to new Owners at that time.

A renewal guarantee period cannot be less than 12 months and cannot extend beyond your Annuity Date unless the period from the last day of the guarantee period to your Annuity Date is less than 12 months. If the period from the last day of the guarantee period to your Annuity Date is less than 12 months, your renewal guarantee period will be the shortest guarantee period we offer and your Annuity Date will become the last day of your new guarantee period.

The Fixed Account

For Contracts issued after December 30, 2011, you may allocate up to 50% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts (unless your Contract was issued in Oregon). For Contracts issued after October 25, 2012 in Oregon, you may allocate up to 50% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts.

For Contracts issued on or before December 30, 2011, you may allocate up to 70% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts (unless your Contract was issued in Oregon). For Contracts issued on or before October 25, 2012 in Oregon, you may allocate up to 70% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts.

Some states have different allocation limits. See "Appendix Q – State Variations of Certain Contract Features."

If you are participating in a Guaranteed Minimum Accumulation Benefit, a Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus or MassMutual Lifetime Income Protector, you cannot make allocations to The Fixed Account. We reserve the right, upon providing you with 30 days advance notice, to change the percentage allowed, or to disallow completely the allocation of Purchase Payments to The Fixed Account. We will only exercise our right to discontinue access to The Fixed Account if the yield on investments will not support the guaranteed minimum interest rate. The guaranteed minimum interest rate is the minimum rate allowed by state law as of the date we issue your Contract. Additionally, we will not exercise this right in an unfairly discriminatory manner.

Transfers

There are additional rules limiting your ability to transfer Contract Value out of or into The Fixed Account. These are detailed in "Transfers and Transfer Programs."

Withdrawals

If you make a partial withdrawal, we will take the withdrawal amount proportionally from your Contract Value in your investment choices as of the Business Day we receive your request in Good Order at our Service Center. Partial withdrawals from The Fixed Account are calculated on a first-in, first-out basis, which means the oldest Purchase Payments are withdrawn first.

Interest Rate

You do not participate in the investment performance of the assets in The Fixed Account. Instead, we credit your Contract with interest at a specified rate that we declare in advance. We will credit an interest rate at a rate not less than the minimum allowed by state law at the time we issue your Contract. We reserve the right to change the guaranteed minimum interest rate for newly issued Contracts, subject to applicable state law.

The Funds

The Funds available as investment choices under the Contract vary between Contract versions. If you have the 2008 Version (Contracts applied for on or after 9/8/2008, subject to state availability), the Funds available under your Contract are listed in "Appendix A – Funds Available Under the Contract." If you have the Pre-2008 Version (Contracts applied for prior to 9/8/2008 or in states where the 2008 Version was unavailable), the Funds available under your Contract are listed in "Appendix A – Funds Available Under the Contract." If your Contract Value is allocated to a Fund, your Contract Value will be influenced by the investment performance of that Fund.

These Funds are only available to insurance company separate accounts and qualified retirement plans, are not available for purchase directly by the general public, and are not the same as other mutual fund portfolios with very similar or nearly identical names and investment goals and policies that are sold directly to the public. While a Fund may have many similarities to these other publicly available mutual funds, you should not expect the investment results of the Fund to be the same as the investment results of those

publicly available mutual funds. We do not guarantee or make any representation that the investment results of the Funds will be comparable to the investment results of any other mutual fund, even a mutual fund with the same investment adviser or manager.

The prospectus for each Fund contains more detailed information about the Fund. You may obtain copies of the Fund prospectuses by contacting our Service Center. If you received a summary prospectus for a Fund, please follow the directions on the first page of the summary prospectus to obtain a copy of the full Fund prospectus.

Addition, Removal, Closure or Substitution of Funds

We have the right to change the funds offered through the Contract, but only as permitted by law. If the law requires, we will also get your approval and the approval of any appropriate regulatory authorities. Changes may only impact certain Owners. Examples of possible changes include: adding new Funds or Fund classes; removing existing Funds or Fund classes; closing existing Funds or Fund classes; or substituting a Fund with a different Fund. New or substitute Funds may have different fees and expenses. We will not add, remove, close or substitute any shares attributable to your interest in a Sub-Account without notice to you and prior approval of the SEC, to the extent required by applicable law. We reserve the right to transfer Separate Account assets to another separate account that we determine to be associated with the class of Contracts to which your Contract belongs.

Conflicts of Interest

The Funds available with the Contract may also be available to registered separate accounts offering variable annuity and variable life products of other affiliated and unaffiliated insurance companies, as well as to the Separate Account and other separate accounts of MassMutual. Although we do not anticipate any disadvantages to this, it is possible that a material conflict may arise between the interests of the Separate Account and one or more of the other separate accounts participating in the Funds. A conflict may occur, for example, as a result of a change in law affecting the operations of variable life and variable annuity separate accounts, differences in the voting instructions of the Owners and payees and those of other insurance companies, or some other reason. In the event of a conflict of interest, we will take steps necessary to protect Owners and payees, including withdrawing the Separate Account from participation in the Funds involved in the conflict or substituting shares of other funds.

We do not recommend or endorse any particular Fund, and we do not provide investment advice. You are responsible for choosing the Funds, and the amounts allocated to each, that are appropriate for your own individual circumstances and your investment goals, financial situation, and risk tolerance. You bear the risk of any decline in your Contract Value resulting from the performance of the Funds that you choose.

Selection of Funds

When we select the Funds offered through the Contract, we consider various factors, including, but not limited to, asset class coverage, the strength of the adviser's or sub-adviser's reputation and tenure, brand recognition, performance, and the capabilities and qualifications of each investment firm. We may also consider whether the Fund, its service providers (e.g., the investment adviser or sub-advisers), or its affiliates will make payments to us or our affiliates in connection with certain administrative, marketing, and support services, or whether affiliates of the Fund can provide marketing and distribution support for sales of the Contracts. (For additional information on these arrangements, see the section below entitled "Compensation We Receive from Funds, Advisers and Sub-Advisers.") We review the Funds periodically and may remove a Fund or limit its availability to new Purchase Payments and/or transfers of Contract Value if we determine that a Fund no longer satisfies one or more of the selection criteria, and/or if the Fund has not attracted significant allocations from Owners.

Compensation We Receive from Funds, Advisers and Sub-Advisers

Compensation We Receive from Advisers and Sub-Advisers

We and certain of our insurance affiliates receive compensation from the advisers and sub-advisers to some of the Funds. We may use this compensation to pay expenses that we incur in promoting, issuing, distributing and administering the Contract, and in providing services on behalf of the Funds in our role as intermediary to the Funds. The amount of this compensation is determined by multiplying a specified annual percentage rate by the average net assets held in that Fund that are attributable to the variable annuity and variable life insurance products issued by us and certain of our insurance affiliates that offer the particular Fund. These percentage rates differ, but currently do not exceed 0.25%. Some advisers and sub-advisers pay us more than others; some do not pay us any such compensation.

The compensation may not be reflected in a Fund's expenses because this compensation may not be paid directly out of a Fund's assets. These payments also may be derived, in whole or in part, from the advisory fee deducted from Fund assets. Owners, through their indirect investment in the Funds, bear the costs of these advisory fees (see the Funds' prospectuses for more information).

In addition, we may receive fixed dollar payments from the advisers and sub-advisers to certain funds so that the adviser and sub-adviser can participate in sales meetings conducted by us. Attending such meetings provides advisers and sub-advisers with opportunities to discuss and promote their funds. For a list of the Funds whose advisers and sub-advisers currently pay such compensation, visit www.MassMutual.com/legal/compensation-arrangements or call our Service Center.

Compensation We Receive from Funds

We and certain of our insurance affiliates also receive compensation from certain Funds pursuant to Rule 12b-1 under the 1940 Act. This compensation is paid out of the Fund's assets and may be as much as 0.25% of the average net assets of an underlying Fund which are attributable to variable contracts issued by certain of our insurance affiliates. An investment in a Fund with a 12b-1 fee will increase the cost of your investment in the Contract.

Voting Rights

We are the legal owner of the Fund shares. When a Fund solicits proxies in conjunction with a vote of shareholders, we are required to obtain, from you and other Owners, instructions as to how to vote those shares.

When we receive those instructions, we will vote all the shares for which we do not receive voting instructions in proportion to those instructions. This will also include any shares that we own on our own behalf. This may result in a small number of Owners controlling the outcome of a vote. If we determine that we are no longer required to vote shares in accordance with Owner instructions, we will vote the shares in our own right.

During the Accumulation Phase, we determine the number of shares you may vote by dividing your Contract Value in each Fund by \$100, including fractional shares. You do not have any voting rights during the Income Phase.

We may, when required by state insurance regulatory authorities, disregard voting instructions, if such instructions would require shares to be voted so as to cause a change in the sub-classification or investment objective of a Fund or to approve or disapprove an investment advisory contract for the Fund. In addition, we may disregard voting instructions that would require a change in the investment policy or investment adviser of one or more of the available Funds. Our disapproval of such change must be reasonable and based on a good faith determination that the change would be contrary to state law or otherwise inappropriate, considering the Fund's objectives and purpose. If we disregard Owner voting instructions, we will advise Owners of our action and the reasons for such action.

Charges and Deductions

This section describes the charges and deductions we make under the Contract to compensate us for the services and benefits we provide, costs and expenses we incur and risks we assume. We may profit from the charges deducted and we may use any such profits for any purpose, including payment of marketing and distribution expenses. These charges and deductions reduce the return on your investment in the Contract.

Insurance Charges

Each Business Day we deduct our insurance charges from the assets of the Separate Account. This charge is calculated based on a percentage of the daily value of the assets invested in each Sub-Account, after Fund expenses are deducted. We do this as part of our calculation of the value of the Accumulation Units and the Annuity Units. The insurance charge has two parts: (1) the mortality and expense risk charge and (2) the administrative charge.

Mortality and Expense Risk Charge

The mortality and expense risk charge is for:

- the mortality risk associated with the insurance benefits provided, including our obligation to make Annuity Payments after the Annuity Date regardless of how long all Annuitants live, the death benefits, and the guarantee of rates used to determine your Annuity Payments during the Income Phase; and
- the expense risk that the current charges will be insufficient to cover the actual cost of administering the Contract.

Mortality and Expense Risk Charge		
<i>When Charge is Deducted</i>	<i>Current (annual rate)</i>	<i>Maximum (annual rate)</i>
Daily as a percentage of the daily value of the assets invested in each Sub-Account	1.00%	1.70%

For all Contracts, if the amount of the charge is more than sufficient to cover the mortality and expense risk, we will make a profit on the charge. We may use this profit for any purpose, including the payment of marketing and distribution expenses for the Contract. If the mortality and expense risk charge is not sufficient to cover the mortality and expense risk, we will bear the loss. If this is the case, we may raise the mortality and expense risk charge in order to restore profitability.

Administrative Charge

This charge reimburses us for the expenses associated with the administration of the Contract and the Separate Account. Some of these expenses are: preparation of the Contract, confirmations, annual reports and statements, maintenance of Contract records, personnel costs, legal and accounting fees, filing fees, and computer and systems costs.

Administrative Charge		
<i>When Charge is Deducted</i>	<i>Current (annual rate)</i>	<i>Maximum (annual rate)</i>
Daily as a percentage of the daily value of the assets invested in each Sub-Account	0.15%	0.25%

We may increase this charge at any time while you own the Contract, but the charge will never exceed the maximum charge amount.

Annual Contract Maintenance Charge

This charge reimburses us for the costs of maintaining the Contract. We will deduct the annual contract maintenance charge proportionately from the Sub-Account(s) you have selected.

Annual Contract Maintenance Charge			
<i>Contract Value at Time Charge is Deducted</i>	<i>When Charge is Deducted</i>	<i>Current</i>	<i>Maximum</i>
Less than \$100,000	On each Contract Anniversary and full withdrawal	\$40	\$60
\$100,000 or more	Not applicable	\$ 0	\$ 0

We may increase this charge at any time while you own the Contract, but the charge will never exceed the maximum charge amount. If we increase this charge, we will give you 90 days prior notice. If you make a full withdrawal from your Contract, we will deduct the full annual contract maintenance charge. If your Contract enters the Income Phase on a date other than its Contract Anniversary, we will deduct a pro rata portion of the charge.

Transfer Fee

Although there is currently no charge to transfer Contract Value among the Sub-Accounts, the Company reserves the right to charge \$20 per transfer in excess of 12 during a single Contract Year. The Company will exercise this right if a significant increase in transfer activity by Owners leads to an increase in costs to administer the Contract.

During the Income Phase, if you are receiving variable payments, we allow six transfers each calendar year and they are not subject to a transfer fee.

Transfer Fee			
	<i>When Charge is Deducted</i>	<i>Current</i>	<i>Maximum</i>
During Accumulation Phase Only	Upon each transfer	\$0	\$20 per transfer for each additional transfer in excess of the 12 free transfers per calendar year

Contingent Deferred Sales Charge (CDSC)

We do not deduct a sales charge when we receive a Purchase Payment. However, we may assess a CDSC for a withdrawal on the amount you withdraw that exceeds the free withdrawal amount and, in most states, on the amount you apply to Annuity Option E. See "Appendix Q – State Variations of Certain Contract Features." We use this charge to cover certain expenses relating to the sale of the Contract. The charge is a percentage of the amount you withdraw or apply to Annuity Option E.

If we assess a CDSC, we will deduct it from the amount you withdraw or apply to Annuity Option E.

The amount of the charge depends on:

- how much you withdraw or apply to Annuity Option E; and
- the length of time between when we issued your Contract and when you make a withdrawal or apply a portion or all of your Contract Value to Annuity Option E.

The Contract has a seven-year CDSC schedule. In most states, when we issue your Contract, you may elect a nine-year CDSC schedule instead of the standard seven-year CDSC schedule. We will provide a credit to your Contract Value if you elect that CDSC schedule. See "Additional Benefits" for more information.

CDSC – 7-Year Schedule	
<i>Contract Year When Withdrawal is Made or Contract Value is Applied to Annuity Option E</i>	<i>CDSC (as a percentage of amount withdrawn or applied to Annuity Option E)</i>
1 st Year	7%
2 nd Year	7%
3 rd Year	7%
4 th Year	6%
5 th Year	5%
6 th Year	4%
7 th Year	3%
8 th Year and later	0%

In addition to the free withdrawals described later in this section, we will not impose a CDSC under the following circumstances.

- Upon payment of the death benefit.
- On amounts withdrawn as RMDs to the extent they exceed the free withdrawal amount. In order to qualify for this exception, the annual RMD must be calculated by us, based solely on the fair market value of the Contract. If you choose to take withdrawals to satisfy your RMD for the Contract outside of our RMD program, or if you choose to take withdrawals from the Contract to satisfy your RMDs for other qualified assets, CDSC may apply.
- Upon application of the Contract Value to any Single Life or Joint and Survivor Life Annuity Option, or to a Period Certain Annuity under Annuity Option E of at least ten years.
- If you redeem excess contributions from a plan qualifying for special income tax treatment. These types of plans are referred to as Qualified Plans, including Individual Retirement Annuities (IRAs). We look to the Internal Revenue Code for the definition and description of excess contributions.
- When the Contract is exchanged for another variable annuity contract issued by us or one of our affiliated insurance companies, C.M. Life Insurance Company or MML Bay State Life Insurance Company, of the type and class which we determine is eligible for such an exchange. A CDSC may apply to the contract received in the exchange. A reduced CDSC schedule may apply under the Contract if another variable annuity contract issued by us or one of our affiliated insurance companies, C.M. Life Insurance Company or MML Bay State Life Insurance Company, is exchanged for the Contract. Exchange programs may not be available in all states. We have the right to modify, suspend or terminate any exchange program any time without prior notification. If you want more information about our current exchange programs, contact your registered representative or us at our Service Center.
- If you are eligible for waiver of the CDSC due to your election of the Nursing Home Waiver Benefit described in “Additional Benefits.”
- If you apply your entire Contract Value to purchase a single premium immediate annuity or a fixed deferred annuity issued by us or one of our affiliates, C.M. Life Insurance Company or MML Bay State Life Insurance Company, subject to certain restrictions.
- On any withdrawals made or amounts applied to an Annuity Option when you reach the latest permitted Annuity Date for your Contract.

Free Withdrawal Amount

The free withdrawal amount is an amount you may withdraw that is not subject to the CDSC. The Contract has a standard 10% free withdrawal provision. In most states, when we issue your Contract you may elect a 10%/20% free withdrawal provision instead of the 10% free withdrawal provision for an additional charge. See “Additional Benefits – 10%/20% Free Withdrawal Feature.”

10% Free Withdrawal Provision

In your first Contract Year, you may withdraw, without incurring a CDSC, up to 10% of your Purchase Payments reduced by any free withdrawal amount(s) previously taken during that Contract Year. For each subsequent Contract Year, you may withdraw up to 10% of your Contract Value as of the end of the previous Contract Year, plus 10% of any Purchase Payment received in the current Contract Year, reduced by any free withdrawal amount(s) previously taken during the current Contract Year. See “Appendix F – Free Withdrawal Amount Examples.” You may take the 10% free withdrawal amount in multiple

withdrawals each Contract Year.

Any unused free withdrawal amount(s) during any particular Contract Year may not be carried over to any succeeding Contract Year.

If you are participating in MassMutual Lifetime Income Protector, and if all or a portion of a free withdrawal is an excess withdrawal as defined in “Additional Benefits – MassMutual Lifetime Income Protector,” the excess withdrawal will negatively impact the MassMutual Lifetime Income Protector benefit.

Premium Taxes

Some states and other governmental entities charge Premium Taxes or similar taxes. We are responsible for the payment of these taxes and may deduct them from your Contract Value, or we may adjust the annuity rates for Premium Tax assessed. Some of these taxes are due when your Contract is issued, others are due when Annuity Payments begin. Currently, we do not charge you for these taxes until you begin receiving Annuity Payments or you make a full withdrawal. We may discontinue this practice and assess the charge when the tax is due. Premium Taxes generally range from 0% to 3.5%, depending on the state.

Income Taxes

We will deduct from the Contract any income taxes which we incur because of the operation of the Separate Account. At the present time, we are not making any such deductions. We will deduct any withholding taxes required by law.

Fund Expenses

The Separate Account purchases shares of the Funds at net asset value. The net asset value of each Fund reflects investment management fees and other expenses already deducted from the assets of the Fund. In addition, one or more of the Funds available as an investment choice may pay a distribution fee out of the Fund's assets to us known as a 12b-1 fee. Any investment in one or more of the Funds with a 12b-1 fee will increase the cost of your investment in the Contract. Please refer to the Fund prospectuses for more information regarding these expenses.

Ownership

Owner

In this prospectus, “you” and “your” refer to the Owner of the Contract. The Owner is named at the time you apply for a Contract. The Owner can be an individual or non-natural person (e.g., a corporation, limited liability company, partnership or certain other entities). The Owner may not be older than Age 90 on the Issue Date (85 for Contracts issued in New York and Oklahoma). The maximum issue Age for the Contract and certain of its additional features may be reduced in connection with the offer of the Contract through certain broker-dealers. You should discuss this with your registered representative. See “Additional Benefits” for Age limits applicable to optional features.

If your Contract is non-qualified and owned by a non-natural person, the Contract will generally not be treated as an annuity for tax purposes. This means that gain in the Contract will be taxed each year while the Contract is in the Accumulation Phase. This treatment is not generally applied to a Contract held by a trust or other entity as an agent for a natural person. Before purchasing a Contract to be owned by a non-natural person or before changing ownership on an existing Contract that will result in it being owned by a non-natural person, you should consult a tax adviser to determine the tax impact. See “Taxes – Non-Natural Owner.”

As the Owner of the Contract, you exercise all rights under the Contract. On or after the Annuity Date, you continue as the Owner. You may change the Owner of a Non-Qualified Contract at any time prior to the Annuity Date by Written Request. However, in certain states, you may not change the Owner(s) without our approval. We will refuse or accept any requested change on a non-discriminatory basis.

The change will take effect on the date the Written Request is signed, unless you specify otherwise. We will not be liable for any payment made or action taken prior to our receipt and approval of the Written Request. A change of Owner that we allow will automatically revoke any prior designation of Owner. If you are participating in MassMutual Lifetime Income Protector or MassMutual Lifetime Payment Plus, changes to an Owner (or an Annuitant, if the Owner is a non-natural person) may terminate the feature. Changing the Owner may result in tax consequences.

See “Taxes – Tax Treatment of Assignments” for more information.

Contracts under qualified plans generally must be held by the plan sponsor or plan trustee. Except for TSAs, Keogh plans and Individual Retirement Annuities (IRAs), an individual cannot be the Owner of a Contract held to fund a qualified plan. Therefore, the individuals covered by the qualified plan have no ownership rights.

Joint Owner

Non-Qualified Contracts can be owned by Joint Owners. However, the Contract cannot be jointly owned if an Owner is a non-natural person and cannot be owned by more than two individuals. The Joint Owner must be at least the Age of majority in the state the Contract is issued, and may not be older than Age 90 on the Issue Date (85 for Contracts issued in New York and Oklahoma). See “Additional Benefits” for Age limits applicable to optional features.

If the Contract is jointly owned, we will use the Age of the oldest Owner to determine all applicable benefits under the Contract. If there are Joint Owners, we require authorization from both Owners for all transactions.

Annuitant

The Annuitant is the person on whose life we base Annuity Payments. You designate the Annuitant at the time of application. Annuitants may not be older than Age 90 on the Issue Date (85 for Contracts issued in New York and Oklahoma).

You may change the Annuitant at any time up to 30 calendar days prior to the Annuity Date, subject to our approval. However, the Annuitant may not be changed on a Contract owned by a non-natural person unless the Contract was issued under a plan pursuant to IRC Section 401(a), 408(a), 408(b) or 408A. We will use the Age of the Annuitant to determine all applicable benefits under a Contract owned by a non-natural person.

When calculating Annuity Payments, we determine Age based on the Annuitant’s nearest birthday on the Annuity Date. See “The Income Phase – Annuity Age.”

Beneficiary

The Beneficiary is the person(s) or entity(ies) you name to receive any death benefit. You name the Beneficiary at the time of application. Unless an irrevocable Beneficiary has been named, you can change the Beneficiary at any time before you die. If you name an irrevocable Beneficiary but choose to change the Beneficiary, you must get written authorization from the irrevocable Beneficiary on our form in Good Order to our Service Center. If you are participating in MassMutual Lifetime Income Protector or MassMutual Lifetime Payment Plus, changes to the Beneficiary may reduce the value of the benefit.

If you are married and your Contract is issued under an ERISA plan, your ability to name a primary Beneficiary other than your spouse is restricted.

Beneficiary IRA

Beneficiary, Inherited, Legacy or “Stretch” IRAs are all terms used to describe an IRA that is used exclusively to distribute death proceeds of an IRA or other qualified investment to the beneficiary over that beneficiary’s life expectancy in order to meet the Required Minimum Distribution (RMD) rules. Upon the contract owner’s death under an IRA or other qualified contract, an “Eligible Designated Beneficiary” may generally establish a Beneficiary IRA by either purchasing a new annuity contract or, in some circumstances, by electing the Beneficiary IRA payout option under the current contract. Until withdrawn, amounts in a Beneficiary IRA continue to be tax-deferred. Amounts withdrawn each year, including amounts that are required to be withdrawn under the RMD rules, are subject to tax.

If the contract owner died on or before December 31, 2019 (on or before December 31, 2021 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement), an individual designated beneficiary, and certain trusts as beneficiary, are treated as Eligible Designated Beneficiaries, and can elect to take distributions over their life expectancy (life expectancy of the oldest trust beneficiary).

However, if the contract owner dies on or after January 1, 2020 (on or after January 1, 2022 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement), only certain designated beneficiaries are treated as Eligible Designated Beneficiaries, and we will only offer the Beneficiary IRA payout option to a designated beneficiary who either (1) is the surviving spouse of the deceased qualified plan participant or IRA owner or, (2) is not more than 10 years younger than the deceased qualified plan participant or IRA owner. In the future, we may allow additional classes of Eligible Designated Beneficiaries to elect the

Beneficiary IRA payout option. For a detailed list of eligibility requirements/restrictions, see “Death Benefit – Beneficiary IRA Election.”

Age

How We Determine Age of Annuitant, Owner and Beneficiary

In this prospectus the term “Age,” except when discussed regarding specific tax provisions, is defined as “insurance Age,” which is a person’s Age on his/her birthday nearest the date for which the Age is being determined. This means we calculate your Age based on your nearest birthday, which could be either your last birthday or your next. For example, Age 80 is generally the period of time between age 79 years, 6 months and 1 day and age 80 and 6 months.

Purchasing a Contract

We no longer sell the MassMutual Transitions Select Contract. However, we continue to administer existing Contracts and we continue to accept Purchase Payments to existing Contracts, subject to the limits described in this section.

Purchase Payments

The minimum amount we accepted for an initial Purchase Payment is:

- \$5,000 when the Contract is bought as a Non-Qualified Contract;
- \$3,000 if you are buying the Contract as a Qualified Contract; or
- \$25,000 if you elected MassMutual Lifetime Income Protector when we issued your Contract.

These amounts may vary by state.

You can make additional Purchase Payments to your Contract throughout the Accumulation Phase, subject to the conditions noted below. You can make additional Purchase Payments by sending payments to our Service Center or one of our purchase payment processing service centers:

- **by check** that clearly indicates your name and Contract number mailed to:

First Class Mail
MassMutual Transitions
Select
Annuity Payment Services
MassMutual PO Box 74908
Chicago, IL 60675-4908

Overnight Mail
MassMutual Transitions Select
Annuity Payment Services
5450 N. Cumberland Ave.
Suite 100
Lockbox 74908
Chicago, IL 60656

- **by wire transfer** to:

JP Morgan Chase Bank
New York, New York
ABA #021000021
MassMutual Account #323956297
Ref: Annuity Contract #
Name: (Your Name)

Additional Purchase Payments of less than \$250 are subject to our approval.

For Contracts issued on or after May 1, 2010, the maximum amount of cumulative Purchase Payments we accept without our prior approval is \$1.5 million.

For Contracts issued in New Jersey, the maximum amount of cumulative Purchase Payments we accept is \$1.5 million.

For all Contracts with an election of MassMutual Lifetime Income Protector, we reserve the right to limit total Purchase Payments after the first Contract Year to \$100,000.

For Contracts issued prior to May 1, 2010, the maximum amount of cumulative Purchase Payments we accept without our prior approval is based on your Age when we issued the Contract. The maximum amount is:

- \$1.5 million up to Age 75; or
- \$500,000 if older than Age 75 or if the Owner is a non-natural person.

For Contracts issued in New Jersey, the maximum amount of cumulative Purchase Payments we accept is based on the Age of the oldest Owner, or the oldest Annuitant if the Owner is non-natural, when we issued the Contract. The maximum amount is:

- \$2 million up to Age 75; or
- \$1 million if older than Age 75.

If there are Joint Owners, Age refers to the oldest Joint Owner. Age is as of the nearest birthday. For example, Age 80 is generally the period of time between age 79 years, 6 months and 1 day and age 80 and 6 months. See "Age."

If you make additional Purchase Payments, we will credit these amounts to your Contract on the Business Day we receive them and all necessary information in Good Order at one of our purchase payment processing service centers. If we receive your Purchase Payment on a Non-Business Day or after the Close of Business, we will credit the amount to your Contract effective the next Business Day.

We reserve the right to reject any application or Purchase Payment. See "Other Information – Reservation of Rights" for more information.

Automatic Investment Plan (AIP)

Under the AIP, you may authorize us to periodically draw funds from an account of your choosing (restrictions may apply) for the purpose of making Purchase Payments to your Contract. Contact our Service Center for information regarding setting up an AIP and any restrictions regarding use of the AIP.

Allocation of Purchase Payments

When you purchased your Contract, we allocated your Purchase Payment among the investment choices according to the allocation instructions you provided. If you make additional Purchase Payments, we will allocate them based on your current allocation instructions, unless you request a different allocation by sending us a Written Request.

Any allocations to the Sub-Accounts that invest in the Funds that you have selected must be in whole percentages and must total 100%. We reserve the right to limit the number of investment choices that you may invest in to a maximum of 18 investment choices (including The Fixed Accounts) at any one time in the event administrative burdens require such a limitation.

If you are participating in a transfer program, Asset Allocation Program, Guaranteed Minimum Accumulation Benefit, Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus or MassMutual Lifetime Income Protector, allocation restrictions apply. See "Transfers and Transfer Programs," "Additional Benefits – Guaranteed Minimum Accumulation Benefit," "Additional Benefits – Basic Guaranteed Minimum Income Benefit (GMIB)," "Additional Benefits – MassMutual Lifetime Payment Plus Examples" and "Additional Benefits – MassMutual Lifetime Income Protector."

The Fixed Account and the Long-Term Guarantee Fixed Accounts

For Contracts issued after December 30, 2011, you may allocate up to 50% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts (unless your Contract was issued in Oregon). For Contracts issued after October 25, 2012 in Oregon, you may allocate up to 50% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts.

For Contracts issued on or before December 30, 2011, you may allocate up to 70% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts (unless your Contract was issued in Oregon). For Contracts issued on or before October 25, 2012 in Oregon, you may allocate up to 70% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts.

Some states have different allocation limits. See "Appendix Q – State Variations of Certain Contract Features."

If you are participating in a Guaranteed Minimum Accumulation Benefit, Guaranteed Minimum Income Benefit, Guaranteed Minimum Withdrawal Benefit or MassMutual Lifetime Income Protector, you cannot make allocations to The Fixed Account or to the Long-Term Guarantee Fixed Accounts. We reserve the right, upon providing you with 30 days advance notice, to change the percentage allowed, or to disallow completely the allocation of Purchase Payments to The Fixed Account or the Long-Term Guarantee Fixed Accounts. We will only exercise our right to discontinue access to The Fixed Account and the Long-Term Guarantee Fixed Accounts if the yield on investments will not support the guaranteed minimum interest rate. The guaranteed minimum interest rate is the minimum rate allowed by state law as of the date we issue your Contract. Additionally, we will not exercise this right in an unfairly discriminatory manner.

Contract Value

Your Contract Value is the sum of your values in the Sub-Accounts and the Fixed Account(s).

The value of your investments in the Separate Account will vary depending on the investment performance of the Funds you choose. In order to keep track of your Contract Value in the Separate Account, we use a unit of measure called an Accumulation Unit. During the Income Phase of your Contract, we call the unit an annuity unit if a variable annuity option is elected.

Accumulation Units

Every Business Day we determine the value of an Accumulation Unit for each of the Sub-Accounts. Changes in the Accumulation Unit value reflect the investment performance of the Fund as well as deductions for insurance and other charges. The value of an Accumulation Unit may go up or down from Business Day to Business Day.

When you make a Purchase Payment, we credit your Contract with Accumulation Units. We determine the number of Accumulation Units to credit by dividing the amount of the Purchase Payment allocated to a Sub-Account by the value of the Accumulation Unit for that Sub-Account. When you make a withdrawal, we deduct from your Contract Accumulation Units representing the withdrawal amount.

We calculate the value of an Accumulation Unit for each Sub-Account after the Close of Business each Business Day. Any change in the Accumulation Unit value will be reflected in your Contract Value.

Calculation of Accumulation Unit Values

During the Accumulation Phase, Accumulation Units shall be used to account for all amounts allocated to or withdrawn from the Sub-Accounts as a result of Purchase Payments, withdrawals, transfers, or fees and charges. MassMutual will determine the number of Accumulation Units of a Sub-Account purchased or canceled. This will be done by dividing the amount allocated to (or the amount withdrawn from) the Sub-Account by the dollar value of one Accumulation Unit of the Sub-Account as of the end of the Business Day during which the transaction is received at the Service Center.

The Accumulation Unit value for each Sub-Account was set on the date such Sub-Account became operative. Subsequent Accumulation Unit values for each Sub-Account are determined for each Business Day by multiplying the Accumulation Unit value for the immediately preceding Business Day by the net investment factor for the Sub-Account for the current Business Day.

The net investment factor for each Sub-Account is determined by dividing A by B and subtracting C where:

- A is (i) the net asset value per share of the funding vehicle or portfolio of a funding vehicle held by the Sub-Account for the current Business Day; plus (ii) any dividend per share declared on behalf of such funding vehicle or portfolio of a funding vehicle that has an ex-dividend date within the current Business Day; less (iii) the cumulative charge or credit for taxes reserved which is determined by MassMutual to have resulted from the operation or maintenance of the Sub-Account.
- B is the net asset value per share of the funding vehicle or portfolio held by the Sub-Account for the immediately preceding Business Day, minus the cumulative charge or credit for taxes reserved which is determined by MassMutual to have resulted from the operation or maintenance of the Sub-Account as of the immediately preceding Business Day.
- C is the cumulative charge since the immediately preceding Business Day for the insurance charges.

Example:

On Monday we receive an additional Purchase Payment of \$5,000 from you. You have told us you want this to go to the MML Managed Bond Sub-Account. When the NYSE closes on that Monday, we determine that the value of an Accumulation Unit for the MML Managed Bond Sub-Account is \$13.90. We then divide \$5,000 by \$13.90 and credit your Contract on Monday night with 359.71 Accumulation Units for the MML Managed Bond Sub-Account.

Right to Cancel Your Contract

You have a right to examine your Contract (sometimes referred to as a Free Look period). If you change your mind about owning your Contract, you can cancel it within ten calendar days after receiving it. This time period may vary by state. When you cancel the Contract within this time period, we will not assess a CDSC. Unless your state has other requirements, you will receive back your Contract Value as of the Business Day we receive your Contract and your Written Request in Good Order at our Service Center, and your Contract will be terminated. If you purchase the Contract as an IRA, we will return the greater of your Purchase Payments less any withdrawals, or the Contract Value.

Sending Requests in Good Order

From time to time you may want to submit a request for transfer among investment choices, a withdrawal, a change of Beneficiary, or some other action. We can only act upon your request if we receive it in "Good Order." Contact our Service Center to learn what information we require for your request to be in "Good Order." Generally, your request must include the information and/or documentation we need to complete the action without using our own discretion to carry it out. Additionally, some actions may require that you submit your request on our form. We may, in our sole discretion, determine whether any particular transaction request is in Good Order, and we reserve the right to change or waive any Good Order requirements at any time. To help protect against unauthorized or fraudulent telephone instructions, we will use reasonable procedures to confirm that telephone instructions given to us are genuine. We may record all telephone instructions.

In addition to Written Requests, we may allow requests to our Service Center:

- by fax at (866) 329-4272,
- by email at ANNfax@MassMutual.com,
- by telephone at (800) 272-2216, or
- by internet at www.MassMutual.com.

Fax, telephone, email, or internet transactions may not always be available. Fax, telephone, and computer systems can experience outages or slowdowns for a variety of reasons. These outages or slowdowns may prevent or delay our receipt of your request. We may make these additional methods available at our discretion. They may be suspended or discontinued at any time without notice. Not all transaction types can be requested by fax, telephone, or the internet.

Transfers and Transfer Programs

General Overview

Generally, you can transfer all or part of your Contract Value among investment choices. However, there are restrictions that are detailed later in this section. You can make transfers by Written Request, email, telephone, fax, or other authorized means. You must clearly indicate the amount and investment choices from and to which you wish to transfer. Your registered representative may provide us with instructions on your behalf involving Fund transfers subject to our rules and requirements, including the restrictions on frequent trading and market timing activities. We reserve the right, at any time and without prior notice to any party, to terminate, suspend, or modify the transfer provisions of this Contract.

Your transfer is effective at the Close of Business on the Business Day we receive your Written Request, in Good Order, at our Service Center. If we receive your transfer request at our Service Center in Good Order on a Non-Business Day or after Close of Business, your transfer request will be effective on the next Business Day.

Transfers During the Accumulation Phase

You may transfer all or part of your Contract Value allocated to a Sub-Account. You can make a transfer to or from any Sub-Account. See "Additional Benefits" for transfer restrictions applicable to certain features. During the Accumulation Phase, we do not assess a transfer fee. However, we reserve the right to only allow 12 free transfers per calendar year and to charge \$20 for each additional transfer in excess of 12.

Currently, we do not restrict the amount you can transfer during the Accumulation Phase. However, we reserve the right to impose a minimum transfer amount of \$1,000 or the entire amount in a Sub-Account, if less. We waive this requirement if a transfer is made due to participation in an Asset Allocation Program, the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, the DCA Fixed Accounts or the Automatic Rebalancing Program. Currently, we do not require that a minimum balance remain in a Sub-Account after a transfer. However, we reserve the right to require that \$1,000 remain in the Sub-Account after a transfer unless you transfer your entire Contract Value in the Sub-Account.

Limits on Transfers

References to "The Fixed Account" pertain only to The Fixed Account and not the DCA Fixed Accounts. For DCA Fixed Account transfer rules see "Investment Choices – The Fixed Accounts – The DCA Fixed Accounts."

- For Contracts issued after December 30, 2011, we currently limit any transfer from the Funds such that no transfer can cause your combined value in The Fixed Account and the Long-Term Guarantee Fixed Accounts to exceed 50% of your total Contract Value (unless your Contract was issued in Oregon). For Contracts issued after October 25, 2012 in Oregon, we currently limit any transfer from the Funds such that no transfer can cause your combined value in The Fixed Account and the Long-Term Guarantee Fixed Accounts to exceed 50% of your total Contract Value.

For Contracts issued on or before December 30, 2011, we currently limit any transfer from the funds such that no transfer can cause your combined value in The Fixed Account and the Long-Term Guarantee Fixed Accounts to exceed 70% of your total Contract Value (unless your Contract was issued in Oregon). For Contracts issued on or before October 25, 2012 in Oregon, we currently limit any transfer from the Funds such that no transfer can cause your combined value in The Fixed Account and the Long-Term Guarantee Fixed Accounts to exceed 70% of your total Contract Value.

Some states have different allocation limits. See "Appendix Q – State Variations of Certain Contract Features."

We reserve the right, upon providing you with 30 days Written Notice, to change these percentage limits or to disallow transfers to The Fixed Account and the Long-Term Guarantee Fixed Accounts.

- If your Contract Value in The Fixed Account is \$500 or less at the time of your transfer, then you may transfer the entire amount out of The Fixed Account.

If your Contract Value in The Fixed Account is more than \$500, then we limit the amount you can transfer out of The Fixed Account. Each Contract Year, we will allow you to transfer up to 30% of your Contract Value in The Fixed Account as of your first transfer in that Contract Year. The 30% can be transferred at one time, or through several transfers during the Contract Year. If you transfer 30% of your Contract Value in The Fixed Account for three consecutive Contract Years, in the fourth consecutive Contract Year you may transfer up to the entire amount in The Fixed Account, provided that you have not applied payments or transferred Contract Value into The Fixed Account from the time the first annual transfer was made. We

measure a Contract Year from the anniversary of the day we issued your Contract. We calculate transfers out of The Fixed Account on a first-in, first-out basis. In other words, we transfer amounts attributed to the oldest Purchase Payments first; then we transfer amounts attributed to the next oldest Purchase Payment; and so on.

- You may not transfer Contract Value from The Fixed Account to the Long-Term Guarantee Fixed Accounts or a money market fund. For a period of 90 days after you transfer Contract Value out of The Fixed Account, you may not transfer any Contract Value into The Fixed Account, the Long-Term Guarantee Fixed Accounts or a money market fund.
- If you are participating in a transfer program, an Asset Allocation Program, a Guaranteed Minimum Accumulation Benefit, a Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus or MassMutual Lifetime Income Protector, additional transfer restrictions may apply. See “Transfers and Transfer Programs,” “Additional Benefits – Guaranteed Minimum Accumulation Benefit,” “Additional Benefits – Basic Guaranteed Minimum Income Benefit,” “Additional Benefits – MassMutual Lifetime Payment Plus” and “Additional Benefits – MassMutual Lifetime Income Protector.”

Transfers During the Income Phase

During the Income Phase, if you are receiving variable payments, you may make six transfers between the Sub-Accounts each calendar year. We will not assess a transfer fee on those transfers. You cannot transfer from the General Account to a Sub-Account, but you can transfer from one or more Sub-Account to the General Account once each Contract Year. We currently do not restrict the amount that you can transfer. However, we reserve the right to institute a minimum transfer amount equal to \$1,000 or the entire value in a Sub-Account, if less. After a transfer, the minimum amount which must remain in a Fund is \$1,000 unless you have transferred the entire value.

Asset Allocation Programs

We restrict which Asset Allocation Programs are available to you based on your elected additional features and when your Contract is issued.

Asset Allocation Programs and Additional Features

You must elect an Asset Allocation Program if you are participating in:

- MassMutual Lifetime Income Protector; or
- Guaranteed Minimum Accumulation Benefit (GMAB); or
- Guaranteed Minimum Income Benefit (GMIB); or
- MassMutual Lifetime Payment Plus.

If you are participating in one of the features listed above, we describe in this section which Asset Allocation Programs are available to you.

If you are not participating in GMIB, GMAB, MassMutual Lifetime Payment Plus or MassMutual Lifetime Income Protector, you may elect to participate in the following Asset Allocation Programs:

- Asset Allocation Funds; or
- Custom Allocation Choice (for Contracts issued prior to 5/1/2010); or
- Directed Allocation Models. (Directed Allocation Models are only available if you were participating in a model as of 1/18/2008. If you subsequently elect a different Asset Allocation Program, you cannot return to the Directed Allocation Models.)

Transfers Within Asset Allocation Programs

You may make transfers as permitted within your elected Asset Allocation Program and you may transfer from one Asset Allocation Program to another (subject to availability). If you are participating in the GMAB, GMIB or MassMutual Lifetime Payment Plus, you may make transfers outside of the Asset Allocation Programs only if you first cancel your election of the GMAB, GMIB or MassMutual Lifetime Payment Plus and then make the transfer request subject to the terms and conditions described in “Transfers and Transfer Programs.” If you are participating in MassMutual Lifetime Income Protector you cannot make transfers outside of the Asset Allocation Programs.

For Contracts Issued on or after 5/1/2010

Asset Allocation Programs Available with MassMutual Lifetime Income Protector

If you participate in MassMutual Lifetime Income Protector, you must elect one of the following Asset Allocation Programs:

- Custom Allocation Choice Select; or
- Asset Allocation Funds (restrictions apply, see “Asset Allocation Programs – Asset Allocation Funds” in this section).

Asset Allocation Programs Available with the GMAB

If you participate in the GMAB, you must elect one of the following Asset Allocation Programs:

- Custom Allocation Choice Select; or
- Asset Allocation Funds (restrictions apply, see “Asset Allocation Programs – Asset Allocation Funds” in this section).

For Contracts Issued Prior to 5/1/2010

Asset Allocation Programs Available with MassMutual Lifetime Income Protector

If you participate in MassMutual Lifetime Income Protector, you must elect one of the following Asset Allocation Programs:

- Custom Allocation Choice Select; or
- Asset Allocation Funds (restrictions apply, see “Asset Allocation Programs – Asset Allocation Funds” in this section).

Asset Allocation Programs Available with the GMAB, GMIB and MassMutual Lifetime Payment Plus

If you participate in the GMAB, GMIB or MassMutual Lifetime Payment Plus you must elect one of the following Asset Allocation Programs:

- Custom Allocation Choice Select (only available with GMAB); or
- Custom Allocation Choice; or
- Asset Allocation Funds (restrictions apply see, “Asset Allocation Programs – Asset Allocation Funds” in this section); or
- Directed Allocation Models. (Directed Allocation Models are unavailable with MassMutual Lifetime Payment Plus. Additionally, Directed Allocation Models are only available if you were participating in a model as of 1/18/2008. If you subsequently elect a different Asset Allocation Program, you cannot return to the Directed Allocation Models.)

Custom Allocation Choice Select

You may only elect Custom Allocation Choice Select if you are participating in GMAB or MassMutual Lifetime Income Protector. If you elect Custom Allocation Choice Select, you must allocate your Contract Value within the Custom Allocation Choice Select parameters. The parameters are the minimum and maximum that may be allocated to each style of investment choice offered through Custom Allocation Choice Select. Periodically, we will rebalance your Contract Value so that it continues to follow the parameters. You can elect that the rebalancing occur quarterly, annually or semiannually during each calendar year. If you do not make an election, rebalancing will occur quarterly. See “Appendix B” for Custom Allocation Choice Select parameters and investment choices. Participation in Custom Allocation Choice Select does not assure a profit and does not protect you against loss in a declining market. We will terminate your participation in Custom Allocation Choice Select:

- if you apply your full Contract Value to an Annuity Option;
- if you withdraw the total Contract Value; or
- upon payment of the death benefit.

Additionally, unless you are participating in MassMutual Lifetime Income Protector, you may request that we end the program

(in writing or by telephone).

Asset Allocation Funds

If you are participating in MassMutual Lifetime Income Protector, GMAB, GMIB or MassMutual Lifetime Payment Plus, you can fulfill our requirement that you participate in an Asset Allocation Program, by allocating all of your Contract Value to one of our Asset Allocation Funds. While participating in this program you can make transfers by moving your full Contract Value from one Asset Allocation Fund to another.

The Funds are as follows:

- MML Aggressive Allocation Fund⁽¹⁾
- MML American Funds Core Allocation Fund
- MML Balanced Allocation Fund
- MML Conservative Allocation Fund
- MML Growth Allocation Fund⁽²⁾
- MML Moderate Allocation Fund

These Funds are also available if you do not have an election of MassMutual Lifetime Income Protector, a GMAB, GMIB or MassMutual Lifetime Payment Plus. In such case you may allocate a portion or all of your Contract Value to these Funds.

(1) The MML Aggressive Allocation Fund is not available as an investment choice if you are participating in MassMutual Lifetime Income Protector, MassMutual Guaranteed Income Plus 6 or MassMutual Lifetime Payment Plus. Additionally, this Fund is unavailable if your Contract was issued on or after 4/15/2009 and you are participating in MassMutual Guaranteed Income Plus 5 or the Guaranteed Minimum Accumulation Benefit.

(2) The MML Growth Allocation Fund is not available as an investment choice if you are participating in MassMutual Lifetime Income Protector. Additionally, this Fund is unavailable if your Contract was issued on or after 5/1/2010 and you are participating in the Guaranteed Minimum Accumulation Benefit.

Custom Allocation Choice

If you elect Custom Allocation Choice, you must allocate your Contract Value within the Custom Allocation Choice parameters. The parameters are the minimum and maximum that may be allocated to each style of investment choice offered through the Contract. Periodically, we will rebalance your Contract Value so that it continues to follow the parameters. You can elect that the rebalancing occur quarterly, annually or semi-annually during each calendar year. If you do not make an election, rebalancing will occur quarterly. Custom Allocation Choice parameters and investment choices are shown in "Appendix B – Funds Available Under the Benefits Offered Under the Contract." Participation in Custom Allocation Choice does not assure a profit and does not protect you against loss in a declining market. We will terminate your participation in Custom Allocation Choice:

- if you apply your full Contract Value to an Annuity Option;
- if you withdraw the total Contract Value;
- upon payment of the death benefit; or
- if you request that we end the program (in writing or by telephone).

Directed Allocation Models

If you elect a directed allocation model (model), the model you elect will determine which investment choices your Contract Value is invested in and how much of your Contract Value is allocated to each investment choice. The directed allocation models are static models which means the underlying investment allocations within each model will not change over time.

Participation in a model does not assure a profit and does not protect you against loss in a declining market. We will rebalance your Contract Value each calendar year quarter so it continues to follow your elected model strategy. Contract Value in The Fixed Accounts will not be rebalanced. For a detailed description of the available models, contact our Service Center or your registered representative.

While participating in a model you may transfer your Contract Value by changing models. If you do submit a transfer request other than a request to change your model, we will terminate your participation in the directed allocation models and notify you of the termination.

An exception to this is if you transfer Contract Value from The Fixed Account or the Long-Term Guarantee Fixed Accounts into a Fund or Funds. In this case we will not cancel your participation in the directed allocation models.

Additionally, we will terminate your participation in the directed allocation models:

- if you apply your full Contract Value to an Annuity Option;
- if you withdraw the total Contract Value;
- upon payment of the death benefit; or
- if you request that we end the program (in writing or by telephone).

If you transfer out of the directed allocation models, they are no longer available for you to re-elect after 1/18/2008.

Transfer Programs

For detailed rules and restrictions pertaining to these programs and instructions for electing a program, contact our Service Center.

Overview

We currently offer the following transfer programs: Separate Account Dollar Cost Averaging Program, Automatic Rebalancing Program, and Interest Sweep Option.

These programs are only available during the Accumulation Phase of your Contract. You may participate only in one of these programs at any one time.

You may not participate in these programs if you have a current election of the DCA Fixed Account, an Asset Allocation Program, Guaranteed Minimum Accumulation Benefit, Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus or MassMutual Lifetime Income Protector.

Separate Account Dollar Cost Averaging Program

This program allows you to systematically transfer a set amount or percentage from a Sub-Account to any of the other Sub-Account(s). By allocating amounts on a regular schedule as opposed to allocating the total amount at one particular time, you may be less susceptible to the impact of market fluctuations. Dollar cost averaging does not assure a profit and does not protect you against loss in declining markets. Since dollar cost averaging involves continuous investment in securities regardless of fluctuating price levels of such securities, you should consider your financial ability to continue the program through periods of fluctuating price levels.

Your Separate Account Dollar Cost Averaging Program will terminate:

- if you withdraw the total Contract Value;
- upon payment of the death benefit;
- if the last transfer you selected has been made;
- if you apply your full Contract Value to an Annuity Option;
- if there is insufficient Contract Value in the selected Sub-Account to make the transfer; or
- if we receive from you a Written Request or a request over the telephone to terminate the program at our Service Center prior to the next transfer date.

Automatic Rebalancing Program

Over time, the performance of each Sub-Account may cause your allocation to shift from your original allocation. You can direct us to automatically rebalance your Contract Value allocated to the Sub-Accounts in order to return to your original percentage allocations by selecting our Automatic Rebalancing Program. Contract Value allocated to The Fixed Account cannot participate in the Automatic Rebalancing Program.

This program will terminate:

- if you withdraw the total Contract Value;
- upon payment of the death benefit;
- if you apply your full Contract Value to an Annuity Option;
- if we receive any unscheduled transfer request; or
- if we receive from you a Written Request or request over the telephone to terminate the program at our Service Center prior to the next transfer date.

Interest Sweep Option

Under this program, we will automatically transfer earnings from your Contract Value in The Fixed Account to any one Sub-Account or combination of Sub-Accounts that you select. By allocating these earnings to the Sub-Accounts, you can pursue further growth in the value of your Contract through more aggressive investments. However, the Interest Sweep Option does not assure a profit and does not protect against loss in declining markets.

This program will terminate:

- if, as the result of a withdrawal, you no longer have Contract Value in The Fixed Account;
- if, at time of transfer, no interest is available for transfer (for example, if the interest earned is required to cover Contract related charges or has been part of a partial withdrawal);
- if you apply your full Contract Value to an Annuity Option;
- upon payment of the death benefit; or
- if we receive from you a Written Request or request over the telephone to terminate the program at our Service Center prior to the next transfer date.

Limits on Frequent Trading and Market Timing Activity

The Contract and its investment choices are not designed to serve as vehicles for what we have determined to be frequent trading or market timing trading activity. We consider these activities to be abusive trading practices that can disrupt the management of a Fund in the following ways:

- by requiring the Fund to keep more of its assets liquid rather than investing them for long-term growth, resulting in lost investment opportunity; and
- by causing unplanned portfolio turnover.

These disruptions, in turn, can result in increased expenses and can have an adverse effect on Fund performance that could impact all Owners and Beneficiaries under the Contract, including long-term Owners who do not engage in these activities.

Therefore, we discourage frequent trading and market timing trading activity and will not accommodate frequent transfers of Contract Value among the Funds. Organizations and individuals that intend to trade frequently and/or use market timing investment strategies should not purchase the Contract.

We have adopted policies and procedures to help us identify those individuals or entities that we determine may be engaging in frequent trading and/or market timing trading activities. We monitor trading activity to uniformly enforce those procedures.

However, those who engage in such activities may employ a variety of techniques to avoid detection. Our ability to detect frequent trading or market timing may be limited by operational or technological systems, as well as by our ability to predict strategies employed by Owners (or those acting on their behalf) to avoid detection. Therefore, despite our efforts to prevent frequent trading and the market timing of Funds among the Sub-Accounts, there can be no assurance that we will be able to identify and curtail every instance of trading of those who trade frequently or those who employ a market timing strategy or those who act as intermediaries on behalf of such persons. Moreover, our ability to discourage and restrict frequent trading or market timing may be limited by decisions of state regulatory bodies and court orders that we cannot predict.

In addition, some of the Funds are available with variable products issued by other insurance companies. We do not know the effectiveness of the policies and procedures used by these other insurance companies to detect frequent trading and/or market timing. As a result of these factors, the Funds may reflect lower performance and higher expenses across all Contracts as a result of undetected abusive trading practices.

If we, or any investment adviser to any of the Funds available with the Contract, determine that an Owner's transfer patterns reflect frequent trading or employment of a market timing strategy, we will allow the Owner to submit transfer requests by regular mail only. We will not accept other Owner transfer requests if submitted by overnight mail, fax, the telephone, our website, or any other type of electronic medium. Additionally, we may reject any single trade that we determine to be abusive or harmful to the Fund. Orders for the purchase of Fund shares may be subject to acceptance by the Fund. Therefore, we reserve the right to reject, without prior notice, any Fund transfer request if the investment in the Fund is not accepted for any reason.

The Funds may assess a redemption fee (which we reserve the right to collect) on shares held for a relatively short period. The prospectuses for the Funds describe the Funds' frequent trading and market timing policies and procedures, which may be more or less restrictive than the policies and procedures we have adopted. We have entered into a written agreement, as required by SEC regulation, with each Fund or its principal underwriter that obligates us to provide to the Fund promptly upon request certain information about the trading activity of individual Owners, and to execute instructions from the Fund to restrict or prohibit further purchases or transfers by specific Owners who violate the frequent trading or market timing policies established by the Fund.

Owners and other persons with interests in the Contracts should be aware that the purchase and redemption orders received by the Funds generally are "omnibus" orders from intermediaries, such as retirement plans or separate accounts funding variable insurance contracts. The omnibus orders reflect the aggregation and netting of multiple orders from individual owners of variable contracts and/

or individual retirement plan participants. The omnibus nature of these orders may limit the Funds in their ability to apply their frequent trading or market timing policies and procedures. It may also require that we restrict or prohibit further purchases or transfers as requested by a Fund on all contracts owned by an Owner whose trading activity under one variable contract has violated a Fund's frequent trading or market timing policy. If a Fund believes that an omnibus order reflects one or more transfer requests from Owners engaged in frequent trading or market timing activity, the Fund may reject the entire omnibus order.

We will notify you in writing if we reject a transfer or if we implement a restriction due to frequent trading or the use of market timing investment strategies. If we do not accept a transfer request, no change will be made to your allocations per that request. We will then allow you to resubmit the rejected transfer by regular mail only.

Additionally, we may in the future take any of the following restrictive actions that are designed to prevent the employment of a frequent trading or market timing strategy:

- not accept transfer instructions from an Owner or other person authorized to conduct a transfer;
- limit the number of transfer requests that can be made during a Contract Year; and
- require the value transferred into a Fund to remain in that Fund for a particular period of time before it can be transferred out of the Fund.

We will apply any restrictive action we take uniformly to all Owners we believe are employing a frequent trading or market timing strategy. These restrictive actions may not work to deter frequent trading or market timing activity.

We reserve the right to revise our procedures for detecting frequent trading and/or market timing at any time without prior notice if we determine it is necessary to do so in order to better detect frequent trading and/or market timing, to comply with state or federal regulatory requirements, or to impose different restrictions on frequent traders and/or market timers. If we modify our procedures, we will apply the new procedure uniformly to all Owners.

The Income Phase

Overview

If you want to receive regular income from your Contract, you may elect to apply all or part of your Contract Value to one of the Annuity Options described in this section and receive fixed and/or variable Annuity Payments. We may base Annuity Payments on the Age and sex of the Annuitant(s) under all options except Annuity Option E. We may require proof of age and sex before Annuity Payments begin.

If the Contract Value to be applied is less than \$2,000 on the Annuity Date, we reserve the right to pay you a lump sum rather than a series of Annuity Payments. If any Annuity Payment is less than \$100 (\$20 for Contracts issued in New York), we reserve the right to change the payment basis to equivalent quarterly, semi-annual, or annual payments.

Applying Part of Your Contract Value to an Annuity Option

You may elect to apply part of the Contract Value from your Qualified or Non-Qualified Contract to an Annuity Option instead of your full Contract Value. We will treat the amount applied as a withdrawal of Contract Value that may qualify for favorable tax treatment under federal law. See "Taxes – Partial Annuitization." You must specify the portion of your Contract Value to be applied to an Annuity Option, and if it is not the full Contract Value, the amount must be at least \$10,000.

We currently do not restrict the number of times in a Contract Year that you can elect to apply part of your Contract Value to an Annuity Option. However, we reserve the right to limit the number of times that you can elect to apply part of your Contract Value to an Annuity Option to once a Contract Year.

If you choose to apply part of your Contract Value to an Annuity Option, there may be adverse tax consequences. For additional information, see "Taxes – Partial Annuitization of Non-Qualified Contracts" and "Taxes – Partial Annuitization of Qualified Contracts." **Before you apply part of your Contract Value to an Annuity Option, you should consult a qualified tax professional and discuss the tax implications associated with such a transaction. We do not provide tax advice or recommendations.**

Electronic Funds Transfer and Annuity Payments

You may receive Annuity Payments by electronic funds transfer (EFT). However, we only allow an EFT of your Annuity Payments to one account. When you set up an EFT, the account number you provide to us must be used for all Annuity Payments you receive from the Contract. You may change the account number at any time.

Annuity Payment Start Date

You can choose the day, month and year in which Annuity Payments begin; however, the day must be between the 1st and 28th day of the month. We call that date the Annuity Date. According to your Contract, your Annuity Date cannot be earlier than five years after you buy the Contract (13 months for Contracts issued in New York and Florida).

You may choose your Annuity Date when you purchase the Contract. After you purchase your Contract, you can request an earlier Annuity Date by Written Request at least 30 days before the Annuity Date. You can request that we delay your Annuity Date by Written Request or by telephone any time before or on the Annuity Date.

Annuity Payments must begin by the earlier of:

- the 100th birthday of the Annuitant;
- your 100th birthday if you are not the Annuitant or the 100th birthday of the oldest Joint Owner;
- the latest date permitted under state law.

Electing an Annuity Option

On the Annuity Date, we must have written instructions in Good Order at our Service Center regarding your Annuity Option choice, including whether you want fixed and/or variable payments.

If on the Annuity Date we do not have your instructions, we will assume you elected Option B with ten years of payments guaranteed. We will use Contract Value in the Funds and the DCA Fixed Account, if any, to provide a variable portion of each Annuity Payment and Contract Value in The Fixed Account and the Long-Term Guarantee Fixed Account, if any, to provide a fixed portion of each Annuity Payment. If your Contract is a Qualified Contract, we may default you to a different Annuity Option in order to comply with requirements applicable to qualified plans.

Fixed Annuity Payments

If you choose fixed payments, the payment amount will not vary. The payment amount will depend upon the following:

- your Contract Value on the Annuity Date;
- the Annuity Option you elect;
- the Age and sex of the Annuitant or Joint Annuitants, if applicable;
- the minimum guaranteed payout rates associated with your Contract;
- the deduction of a CDSC (may be deducted under Annuity Option E only);
- the application of an interest rate factor adjustment, if applicable; and
- the deduction of premium taxes, if applicable.

In most states, if the single premium immediate annuity rates offered by MassMutual on the Annuity Date are more favorable than the minimum guaranteed rates listed in your Contract, those rates will be used.

For a discussion of how fixed payments are calculated if you apply your GMIB value to an Annuity Option see "Additional Benefits – Guaranteed Minimum Income Benefit (GMIB)."

Variable Annuity Payments

If you choose variable payments, the payment amount will vary with the investment performance of the Funds. The first payment amount will depend on the following:

- your Contract Value on the Annuity Date;
- the Annuity Option you elect;
- the Age and sex of the Annuitant or Joint Annuitants, if applicable;
- the minimum guaranteed payout rates associated with your Contract;
- an assumed investment rate (AIR) of 4% per year;

- the deduction of a CDSC (may be deducted under Annuity Option E only);
- the application of an interest rate factor adjustment, if applicable; and
- the deduction of premium taxes, if applicable.

Future variable payments will depend on the performance of the Funds you selected. If the actual performance on an annualized basis exceeds the 4% assumed investment rate plus the deductions for expenses, your Annuity Payments will increase. Similarly, if the actual rate is less than 4% annualized plus the amount of the deductions, your Annuity Payments will decrease.

For a discussion of whether variable payments are available if you apply your GMIB value to an Annuity Option, when you can apply your GMIB value to an Annuity Option and how such variable payments would be calculated see “Additional Benefits – Guaranteed Minimum Income Benefit (GMIB).”

Annuity Unit Values

In order to keep track of the value of your variable Annuity Payments, we use a unit of measure called an annuity unit. The value of your annuity units will fluctuate to reflect the investment performance of the funds you elected. We calculate the number of your annuity units at the beginning of the Income Phase. During the Income Phase, the number of annuity units will not change unless you make a transfer; make a withdrawal as permitted under certain Annuity Options; or you elect an Annuity Option with reduced payments to the survivor and those payments to the survivor commence. The insurance charge applied as part of the calculation of the annuity unit value will be the insurance charge assessed at the time you apply all or part of your Contract Value to an Annuity Option. The SAI contains more information on how Annuity Payments and annuity unit values are calculated.

Annuity Options

The available Annuity Options are listed in this section in the Annuity Options table. We may consent to other plans of payment in addition to those listed. After Annuity Payments begin, you cannot change the Annuity Option, the frequency of Annuity Payments, or make withdrawals, except as described under Annuity Option E.

RMDs for Qualified Contracts

In order to avoid adverse tax consequences, you should begin to take distributions from your Contract no later than the beginning date required by the IRC. These distributions can be withdrawals or Annuity Payments. The distributions should be at least equal to the minimum amount required by the IRC or paid through an Annuity Option that complies with the RMD rules of IRC Section 401(a)(9). If your Contract is an individual retirement annuity, the required beginning date is no later than April 1 of the calendar year after you reach the “applicable age” specified in IRC Section 401(a)(9)(C). If you were born after December 31, 1950 and before January 1, 1960, your applicable age is 73. If you were born after December 31, 1959, your applicable age is 75. Previously, the age at which RMDs were required to begin was 70½ for those born before July 1, 1949, and 72 for those born after June 30, 1949 and before January 1, 1951. For qualified plans, if you are still working for the sponsor when you reach the specified RMD age, you may defer RMDs until the year in which you retire. The option of deferring to retirement is not available if you are a 5% or greater owner of the employer sponsoring your qualified plan.

Limitations on Payment Options

If you purchased the Contract as a Qualified Contract, the RMD rules that apply to annuitized Contracts during your lifetime may impose restrictions on the payment options that you may elect. In addition, in order to ensure that the Contract will comply with the RMD requirements that apply upon your death, you may not elect a joint and survivor Annuity Option with a non-spouse Joint Annuitant who is more than 10 years younger than you. Furthermore, if your Contract is issued under an ERISA plan, and you are married when your Contract enters the Income Phase, your ability to elect certain Annuity Options may be limited and/or require spousal consent.

Annuity Options

We may consent to other plans of payment in addition to those listed, including a Joint and Last Survivor Annuity with Period Certain. For Qualified Contracts, if, upon the death of the Owner (Annuitant if the Contract is owned by a non-natural person), there are Annuity Payments remaining, we may shorten the remaining payment period in order to ensure that payments do not continue beyond the 10 year post-death distribution period provided under IRC Section 401(a)(9), or beyond the beneficiary's life or life expectancy for certain classes of beneficiaries, such as a spouse or an individual who is not more than 10 years younger than the decedent.

Lifetime Contingent Options (variable and/or fixed payments)				
	<i>Annuity Option A</i>	<i>Annuity Option B</i>	<i>Annuity Option C</i>	<i>Annuity Option D</i>
	<i>Life Income</i>	<i>Life Income with Period Certain</i>	<i>Joint and Last Survivor Annuity</i>	<i>Joint and 2/3 Survivor Annuity</i>
Number of Annuitants:	One	One	Two	Two
Length of Payment Period:	For as long as the Annuitant lives.	For a guaranteed period of either 5, 10 or 20 years or as long as the Annuitant lives, whichever is longer.	For as long as either Annuitant lives.	For as long as either Annuitant lives.
Annuity Payments After Death:	None. All payments end upon the Annuitant's death.	When the Annuitant dies, if there are remaining guaranteed payments, the Beneficiary(ies) may elect to continue receiving remaining guaranteed payments or the Beneficiary(ies) may elect a lump sum payment equal to the commuted value of the remaining guaranteed Annuity Payments. ⁽¹⁾	100% of the payment will continue during the lifetime of the surviving Annuitant. No payments will continue after the death of both Annuitants.	Payments will continue during the lifetime of the surviving Annuitant and will be computed on the basis of two-thirds of the Annuity Payment (or units) in effect during the joint lifetime. No payments will continue after the death of both Annuitants.

(1) In the event that remaining Annuity Payments are commuted, we compute the value of the remaining guaranteed Annuity Payments at an interest rate determined by us.

Non-Lifetime Contingent Options (variable and/or fixed payments)	
	<i>Annuity Option E Period Certain Annuity</i>
Number of Annuitants:	One
Length of Payment Period:	For a specified period no less than five years and no greater than 30 years.
Withdrawal Option/Switch Annuity Option:	If, after you begin receiving payments, you would like to receive all or part of the commuted value of the remaining guaranteed payments under this Annuity Option at any time, you may elect to receive it in a lump sum or have it applied to another Annuity Option. If you so elect, your future payments will be adjusted accordingly. ⁽¹⁾
Contingent Deferred Sales Charge:	In most states, we will deduct a CDSC if you apply all or a part of your Contract Value to this option and the period certain is less than ten years. If it is permitted in your state, but we do not deduct a CDSC at that time, we will deduct a CDSC if you subsequently request a commuted lump sum payment to yourself or a commuted value to apply to another Annuity Option. ⁽¹⁾
Annuity Payments After Death:	When the Annuitant dies, if there are remaining guaranteed payments, the Beneficiary(ies) may elect to continue receiving remaining guaranteed payments or the Beneficiary(ies) may elect a lump sum payment equal to the commuted value of the remaining guaranteed Annuity Payments. We will not deduct a CDSC. ⁽¹⁾

(1) In the event that remaining Annuity Payments are commuted, we compute the value of the remaining guaranteed Annuity Payments at an interest rate determined by us.

Benefits Available Under the Contract

The following table summarizes information about the benefits available under the Contract.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
Basic Death Benefit (9/1/07 Version)	Upon your death, we will pay your designated Beneficiaries the greater of (1) the Contract Value determined as of the Business Day we receive both due proof of death and an election of the payment method in Good Order at our Service Center; or (2) an amount based on your Purchase Payments adjusted for withdrawals and any applicable charges.	Standard	None	<ul style="list-style-type: none">• Only available for Contracts applied for on or after 9/1/2007 (subject to state availability).• Only available if the oldest Owner is under Age 76 at the time of election (oldest Annuitant if Contract is owned by a non-natural person).• This benefit terminates upon full surrender or annuitization of the full Contract Value.• Withdrawals reduce the death benefit amount in direct proportion to the Contract Value reduction. Since withdrawals result in a pro-rata adjustment to the death benefit amount, the death benefit amount may be reduced by more than the actual dollar amount of the withdrawals.• If your death benefit amount is greater than your Contract Value at the time you change your death benefit feature, the change in death benefit feature may result in a decrease in your death benefit amount.• For Contracts electing Lifetime Payment Plus, when we adjust Purchase Payments for subsequent withdrawals, any portion of a withdrawal that exceeds the Guaranteed Lifetime Withdrawal Amount or, if applicable, the Guaranteed Withdrawal Amount, will result in a proportional adjustment for withdrawals. Any withdrawal that does not exceed the Guaranteed Lifetime Withdrawal Amount or, if applicable, the Guaranteed Withdrawal Amount, will reduce the Death Benefit on a dollar for dollar basis. See "Additional Benefits – MassMutual Lifetime Payment Plus."

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
Basic Death Benefit (For Contracts Applied for Prior to 9/1/2007)	<p>Prior to the oldest Owner reaching Age 80, the death benefit is the greater of Contract Value determined as of the Business Day we receive due proof of death and election of a payment method in Good Order at our Service Center or Purchase Payments reduced by an adjustment for withdrawals and any applicable charges.</p> <p>At Age 80 and beyond, the value of the Basic Death Benefit is your Contract Value as of the Business Day we receive due proof of death and election of a payment method in Good Order at our Service Center.</p>	Standard	None	<ul style="list-style-type: none"> Only available for Contracts applied for prior to 9/1/2007. Only available if oldest Owner is under Age 80 at the time of election (oldest Annuitant if Contract is owned by a non-natural person). This benefit terminates upon full surrender or annuitization of the full Contract Value. Withdrawals reduce the death benefit amount in direct proportion to the Contract Value reduction. Since withdrawals result in a pro-rata adjustment to the death benefit amount, the death benefit amount may be reduced by more than the actual dollar amount of the withdrawals. If your death benefit amount is greater than your Contract Value at the time you change your death benefit feature, the change in death benefit feature may result in a decrease in your death benefit amount.
Contract Value Death Benefit	Equal to your Contract Value as of the Business Day we receive due proof of death and election of a payment method in Good Order at our Service Center.	Optional	<p>Receive a Contract credit if it is elected.</p> <p>Current 0.05% of Contract Value</p> <p>Minimum 0.02% of Contract Value</p>	<ul style="list-style-type: none"> For all Contracts issued prior to 9/1/2007, if the oldest Owner (or the Annuitant, if the Contract is owned by a non-natural person) is Age 80 or beyond, we do not provide an annual credit to your Contract Value. If your death benefit amount is greater than your Contract Value at the time you change your death benefit feature, the change in death benefit feature may result in a decrease in your death benefit amount.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
Annual Ratchet Death Benefit	The greater of your Contract Value determined as of the Business Day we receive due proof of death and election of a payment method in Good Order at our Service Center; or the amount of Purchase Payments you have made to the Contract reduced by an adjustment for withdrawals; or the highest anniversary value reduced by an adjustment for withdrawals and increased by any Purchase Payments.	Optional	<i>Maximum:</i> 0.90% of Contract Value <i>Current:</i> 0.40% of Contract Value	<ul style="list-style-type: none"> • Cannot elect Annual Ratchet Death Benefit if participating in MassMutual Lifetime Income Protector. • Once the oldest Owner reaches Age 80 (oldest Annuitant if Contract is owned by a non-natural person), the highest anniversary value will no longer change and will remain as last calculated, except we will increase it if you make subsequent Purchase Payments and we will adjust it for subsequent withdrawals. • When we adjust Purchase Payments for subsequent withdrawals, any portion of a withdrawal that exceeds the Guaranteed Lifetime Withdrawal Amount or, if applicable, the Guaranteed Withdrawal Amount, will result in a proportional adjustment for withdrawals. Any withdrawal that does not exceed the Guaranteed Lifetime Withdrawal Amount or, if applicable, the Guaranteed Withdrawal Amount, will reduce the Death Benefit on a dollar for dollar basis. See "Additional Benefits – MassMutual Lifetime Payment Plus." • If your death benefit amount is greater than your Contract Value at the time you change your death benefit feature, the change in death benefit feature may result in a decrease in your death benefit amount.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
GMAB: 10-Year Benefit with Reset Option GMAB: 20-Year Benefit	If the GMAB is in effect, we guarantee that at the end of your benefit period your Contract Value will be no less than a specified amount called the GMAB value.	Optional	<i>Maximum Fee:</i> 1.00% of Contract Value <i>Current Fee for Contracts issued on or after 5/1/10:</i> 0.95% of Contract Value <i>Current Fee for Contracts issued on or after 9/1/06 and prior to 5/1/10:</i> 0.45% of Contract Value <i>Current Fee for Contracts issued prior to 9/1/06:</i> 0.35% of Contract Value	<ul style="list-style-type: none"> Both the 10 Year and 20 Year GMAB were only available when your Contract was issued. While the GMAB is in effect, you cannot participate in the Automatic Rebalancing Program, the AIP, the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, or a DCA Fixed Account. You also cannot make allocations to The Fixed Accounts. If you elect the GMAB, you may not elect a Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus or MassMutual Lifetime Income Protector. While the GMAB is in effect, you will be subject to allocation restrictions. You will be limited in your choice of Sub-Account investments and may be limited in how much you can invest in certain Sub-Accounts. You will not be able to allocate Contract Value to all of the Sub-Accounts that are available to Owners who have not elected a GMAB. If you request to reset the 10 Year GMAB and it is reset, your 10 year benefit period will start over again. The 20 Year GMAB does not have a reset feature. Withdrawals will negatively impact the GMAB Amount.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
Guaranteed Minimum Income Benefit Basic GMIB (for Contracts prior to 9/1/2007) GMIB 5 (for Contracts from 9/1/2007 to 3/31/2009) GMIB 6 (for Contracts from 9/1/2007 to 12/2/2008)	Provides a minimum floor for a future amount that you may apply to an Annuity Option.	Optional	<u>Basic GMIB:</u> <i>Maximum Charge:</i> 1.25% <i>Current Charge:</i> 0.60% <u>GMIB 5:</u> <i>Maximum Charge:</i> 1.50% <i>Current Charge:</i> 1.50% of the current GMIB value <u>GMIB 6:</u> <i>Maximum Charge:</i> 1.50% <i>Current Charge:</i> 1.50% of the current GMIB value	<u>Basic GMIB:</u> <ul style="list-style-type: none"> • This feature was only available to be elected when your Contract was issued. • You must have been under Age 80 at the time you elected this feature. • When the Annuitant reaches Age 80, the GMIB value will no longer increase. • If you elect the Basic GMIB, you must allocate 100% of your Purchase Payment to an approved Asset Allocation Program. • All withdrawals will negatively impact your GMIB Value. • If you elect the Basic GMIB, you cannot participate in the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, a DCA Fixed Account or the Automatic Rebalancing Program. Also, you cannot make allocations to The Fixed Accounts. • If you elect the Basic GMIB, you may not elect a Guaranteed Minimum Accumulation Benefit.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
				<p><u>GMIB 5 or GMIB 6:</u></p> <ul style="list-style-type: none"> You must not be older than Age 80 at time of Contract issue (for the 2008 Version) or older than Age 75 at time of Contract issue (for the Pre-2008 Version). This feature was only available to be elected when your Contract was issued. You must allocate 100% of your Purchase Payment to an approved Asset Allocation Program. Withdrawal amounts that exceed the annual interest credited to your GMIB Value in the current Contract Year will negatively impact your GMIB Value. You can only apply your GMIB Value to an Annuity Option on the tenth or subsequent Contract Anniversary after your Contract was issued or on the tenth or subsequent Contract Anniversary after your most recent reset. Age restrictions also apply. For the 2008 Version, you may only elect Fixed Annuity Payments. For the Pre-2008 Version, you may elect fixed and/or variable Annuity Payments. Additional Annuity Option restrictions apply. If you elect GMIB 5 or GMIB 6, you cannot participate in the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, a DCA Fixed Account or the Automatic Rebalancing Program. Also, you cannot make allocations to The Fixed Accounts. If you elect GMIB 5 or GMIB 6, you may not elect a Guaranteed Minimum Accumulation Benefit or MassMutual Lifetime Payment Plus.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
MassMutual Lifetime Income ProtectorSM	Provides you with a guaranteed minimum level of income for the life of the covered person, even if your Contract Value is reduced to zero.	Optional	<i>Maximum Charge:</i> 1.95% of income base <i>Current Charge:</i> 0.95% of income base	<ul style="list-style-type: none"> • This feature was only available to Contracts applied for on or after January 11, 2010. • This feature was only able to be elected when your Contract was issued unless your Contract was issued after September 14, 2009 and this feature was not available to elect on your application. • Once elected, this feature cannot be cancelled. • Changes to an Owner (or an Annuitant, if the Owner is a non-natural person) may terminate this feature. • Changes to the Beneficiary may reduce the value of the benefit. • The covered person must be under Age 76 at the time this feature is elected. • Initial Purchase Payment must be \$25,000 or greater. • You cannot stop the Systematic Withdrawal Program of the annual income amount once it begins. • If you elect MassMutual Lifetime Income Protector, you must participate in an approved Asset Allocation Program. • If you elect MassMutual Lifetime Income Protector, you cannot participate in the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, a DCA Fixed Account or the Automatic Rebalancing Program. Also, you cannot make allocations to The Fixed Accounts. • If you elect MassMutual Lifetime Income Protector, you cannot elect the Annual Ratchet Death Benefit or a Guaranteed Minimum Accumulation Benefit. • If you are participating in MassMutual Lifetime Income Protector, any portion of a withdrawal that is an excess withdrawal will result in an adjustment for withdrawals. • Excess withdrawals will reduce and may eliminate the value of the benefit.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
MassMutual Lifetime Payment Plus (Single Life and Joint Life)	Provides a guaranteed withdrawal amount annually for life, even if your Contract Value is zero.	Optional	<p><i>Maximum Charge:</i> 1.50% of benefit base</p> <p><i>Current Charge:</i> 0.60% of benefit base (Single Life); 0.85% of benefit base (Joint Life)</p>	<ul style="list-style-type: none"> • This feature was only available for Contracts applied for on or after January 19, 2008 and prior to March 31, 2009. • This feature was only available to be elected when your Contract was issued. • A change to an Owner (or an Annuitant, if the Owner is a non-natural person) may terminate this feature. • Changes to the Beneficiary may reduce the value of this feature. • If you elect MassMutual Lifetime Payment Plus, you must participate in an approved Asset Allocation Program. • If you elect MassMutual Lifetime Payment Plus, you cannot participate in the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, a DCA Fixed Account or the Automatic Rebalancing Program. Also, you cannot make allocations to The Fixed Accounts. • If you elect MassMutual Lifetime Payment Plus, you may not elect a Guaranteed Minimum Accumulation Benefit or a Guaranteed Minimum Income Benefit. • If you elect MassMutual Lifetime Payment Plus, we will reduce the value of the death benefit when you make withdrawals. • If you are participating in MassMutual Lifetime Payment Plus, any portion of a withdrawal that exceeds the Guaranteed Lifetime Withdrawal Amount or, if applicable, the Guaranteed Withdrawal Amount, will result in a proportional adjustment for withdrawals. • Excess withdrawals may significantly reduce or eliminate the value of the benefit.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
Equalizer Benefit	Provides a credit to your Contract Value at the end of the tenth Contract Year, and every five year Contract period thereafter.	Optional	<i>Maximum Charge:</i> 0.60% of your Contract Value <i>Current Charge:</i> 0.50% of your Contract Value	<ul style="list-style-type: none"> This feature was only available to be elected when your Contract was issued. You could not have elected this feature if you or the oldest Joint Owner (or an Annuitant, if the Contract is owned by a non-natural person) was Age 70 or older when we issued your Contract. We will pay the benefit only until you or the oldest Joint Owner (or Annuitant if the Contract is owned by a non-natural person) reaches Age 80. We will limit individual payments of the benefit to 40% of the amount of your total Purchase Payments less any withdrawals.
Nine Year CDSC	Provides a nine year CDSC schedule rather than the standard seven year CDSC schedule.	Optional	0.10% Contract Value credit	<ul style="list-style-type: none"> Once elected you cannot cancel this feature. Election of the nine year CDSC schedule will result in a higher CDSC percentage in certain years and a longer CDSC period than the standard CDSC available under the Contract.
10%/20% Free Withdrawal	Provides a more generous withdrawal amount that is not subject to a CDSC than is available under the standard free withdrawal provision.	Optional	<i>Maximum:</i> 0.35% of Contract Value <i>Current:</i> 0.25% of Contract Value	<ul style="list-style-type: none"> Once elected you cannot cancel this feature. If MassMutual Lifetime Income Protector is in effect and all or a portion of a free withdrawal is an excess withdrawal, the excess withdrawal will negatively impact the MassMutual Lifetime Income Protector benefit.
Electronic Document Delivery Credit	We will provide an annual \$24 credit to your Contract on your Contract Anniversary if you are participating in our e-Documents Program.	Optional	\$24 annual Contract credit	<ul style="list-style-type: none"> The electronic document delivery credit may be subject to the assessment of a Contingent Deferred Sales Charge upon withdrawal or if you elect to receive an Annuity Payment. We reserve the right to modify or terminate this feature at any time.
Case Size Credit	We will provide a credit to your Contract if your Contract Value exceeds a certain average Contract Value as of the end of each Contract Year.	Optional	0.05%-0.10% credit depending upon case size	<ul style="list-style-type: none"> None

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
DCA Fixed Account	Automatically transfers a specific amount of Contract Value from the DCA Fixed Account to the Sub-Accounts you have selected, at set intervals over a period of either six, twelve, or eighteen months.	Optional	None	<ul style="list-style-type: none"> • Can only participate in one DCA Fixed Account at a time. • Must apply a Purchase Payment of at least \$5,000 to a DCA Term. • You cannot transfer current Contract Value into the DCA Fixed Account. • No unscheduled transfers may be made from the DCA Fixed Account. • If you are participating in a DCA Fixed Account, you cannot also participate in an Asset Allocation Program, the Automatic Rebalancing Program, the Interest Sweep Option, the Separate Account Dollar Cost Averaging Program, a Guaranteed Minimum Accumulation Benefit, a Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus, or MassMutual Lifetime Income Protector.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
Long-Term Guarantee Fixed Account	Provides a specific rate of interest for a specific guaranteed period for assets allocated to that fixed account option.	Optional	None	<ul style="list-style-type: none"> For Contracts issued on or before December 30, 2011, you may allocate up to 70% of each Purchase Payment between The Fixed Account and Long-Term Guarantee Fixed Accounts (unless your Contract was issued in Oregon). For Contracts issued after December 30, 2011, you may allocate up to 50% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts (unless your Contract was issued in Oregon). The minimum Purchase Payment or transfer of Contract Value we permit to any Long-Term Guarantee Fixed Account is \$1,000. We will apply an interest rate factor adjustment to any partial or full withdrawal of Contract Value from a Long-Term Guarantee Fixed Account. The interest rate factor adjustment may increase or decrease your Contract Value. If you are participating in a Guaranteed Minimum Accumulation Benefit, a Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus, or MassMutual Lifetime Income Protector, you cannot make allocations to the Long-Term Guarantee Fixed Account. You may not transfer Contract Value from The Fixed Account to the Long-Term Guarantee Fixed Accounts or a money market fund. For a period of 90 days after you transfer Contract Value out of The Fixed Account, you may not transfer any Contract Value into The Fixed Account, the Long-Term Guarantee Fixed Accounts or a money market fund.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
The Fixed Account	Provides a specified rate of interest for assets allocated to this fixed account option.	Optional	None	<ul style="list-style-type: none"> For Contracts issued on or before December 30, 2011, you may allocate up to 70% of each Purchase Payment or Contract Value to The Fixed Account and Long-Term Guaranteed Fixed Accounts (unless your Contract was issued in Oregon). For Contracts issued after December 30, 2011, you may allocate up to 50% of each Purchase Payment or Contract Value to The Fixed Account and the Long-Term Guarantee Fixed Accounts (unless your Contract was issued in Oregon) If your Contract Value in The Fixed Account is \$500 or less at the time of your transfer, then you may transfer the entire amount out of The Fixed Account. If your Contract Value in The Fixed Account is more than \$500, then we limit the amount you can transfer out of The Fixed Account. You may not transfer Contract Value from The Fixed Account to the Long-Term Guarantee Fixed Accounts or a money market fund. For a period of 90 days after you transfer Contract Value out of The Fixed Account, you may not transfer any Contract Value into The Fixed Account, the Long-Term Guarantee Fixed Accounts or a money market fund. If you are participating in a Guaranteed Minimum Accumulation Benefit, a Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus, or MassMutual Lifetime Income Protector, you cannot make allocations to The Fixed Account.
Automatic Rebalancing Program	Automatically rebalances the Sub-Accounts you select to maintain your original percentage allocation of Contract Value.	Optional	None	<ul style="list-style-type: none"> You cannot participate in Separate Account Dollar Cost Averaging Program and Interest Sweep Option. You cannot participate in the Automatic Rebalancing Program if you elected any of The Fixed Accounts, an Asset Allocation Program, Guaranteed Minimum Accumulation Benefit, Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus, or MassMutual Lifetime Income Protector.

Benefit	Purpose	Benefit is Standard or Optional	Fee	Restrictions/Limitations
Separate Account Dollar Cost Averaging Program	Automatically transfers a specific amount of Contract Value from a single Sub-Account to other Sub-Accounts you have selected, at set intervals.	Optional	None	<ul style="list-style-type: none"> You cannot participate in Automatic Rebalancing Program and Interest Sweep Option. You cannot participate in the Separate Account Dollar Cost Averaging Program if you have elected the DCA Fixed Account, an Asset Allocation Program, Guaranteed Minimum Accumulation Benefit, Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus, or MassMutual Lifetime Income Protector.
Systematic Withdrawal Program	Automatically withdraws a specific amount of Contract Value proportionally from all Sub-Accounts you have selected.	Optional	None	<ul style="list-style-type: none"> In order to participate in this program: (1) there must be at least \$5,000 in Contract Value, and (2) the minimum withdrawal amount must be \$100. You cannot participate in the Systematic Withdrawal Program if you are currently receiving a waiver of CDSC under the Nursing Home Waiver Benefit.
Nursing Home Waiver Benefit	Allows withdrawal of some or all Contract Value without incurring a CDSC if admitted to a licensed nursing care facility or accredited hospital.	Optional	<i>Maximum Charge:</i> 0.10% of Contract Value <i>Current Charge:</i> 0.05% of Contract Value	<ul style="list-style-type: none"> Confinement must begin after the Issue Date. Each withdrawal request must be made one year or more after the Issue Date. Confinement must be for at least 90 consecutive days and must be prescribed by a state licensed medical practitioner. Cannot also participate in a Systematic Withdrawal Program. May not be available in all states. See "Appendix Q – State Variations of Certain Contract Features."
Interest Sweep Option	Automatically transfers earnings from your Contract Value in The Fixed Account to any Fund(s) you select.	Optional	None	<ul style="list-style-type: none"> You cannot also participate in the Automatic Rebalancing Program, Separate Account Dollar Cost Averaging Program, DCA Fixed Account, an Asset Allocation Program, Guaranteed Minimum Accumulation Benefit, Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus, or MassMutual Lifetime Income Protector.

Some of the benefits identified in the Benefits Available Under the Contract table are described in more detail following the table and other benefits are disclosed in more detail in other sections of the prospectus.

Death Benefit

Death of Owner During the Accumulation Phase

If any Owner dies during the Accumulation Phase, we will pay a death benefit to the primary Beneficiary. If any Owner dies, we will treat the surviving Owner as the primary Beneficiary and treat any other Beneficiary designation, on record at the time of death, as a contingent Beneficiary, unless both Joint Owners have submitted a Written Request to our Service Center, in Good Order, requesting otherwise.

The Beneficiary may request that the death benefit be paid under one of the death benefit options. If the sole primary Beneficiary is your spouse and your Contract is a Non-Qualified Contract or is held as a traditional IRA (including SEP and SIMPLE IRAs) or Roth IRA, he or she may elect to become the Owner of the Contract by continuing the Contract at the death benefit amount payable.

Death Benefit Amount During the Accumulation Phase

The death benefit amount depends upon the death benefit feature in effect at the time of your death or, if the Contract is owned by a non-natural entity, the Annuitant's death. The Contract offers three Death Benefit features:

- Basic Death Benefit;
- Annual Ratchet Death Benefit (described in "Additional Benefits");
- Contract Value Death Benefit (described in "Additional Benefits").

For detail regarding the Annual Ratchet Death Benefit and the Contract Value Death Benefit see "Additional Benefits – Additional Death Benefit Features."

We do not assess an additional charge for the Basic Death Benefit. The availability of certain death benefit options may be limited for Qualified Contracts in order to comply with the Required Minimum Distribution rules, and are not available if you are a certain age. These details are included in our description of each death benefit feature.

You may only have one elected death benefit feature at any time. You may add or terminate a death benefit feature effective on any Contract Anniversary as long as we receive, in Good Order, Written Notice of your intention to do so at our Service Center at least 30 calendar days prior to your Contract Anniversary date. Your first Contract Anniversary is one calendar year from the date we issued your Contract.

Basic Death Benefit – (Version 9/1/07)

For Contracts applied for on or after 9/1/2007 (subject to state availability). You may only elect this feature if you are under Age 76 at the time you make the election.

If there are Joint Owners of the Contract, we will use the Age of the oldest Joint Owner to determine the death benefit amount. If the Contract is owned by a non-natural person, we will use the Age of the Annuitant to determine the death benefit amount.

The death benefit paid will be the amount calculated (and adjusted for any applicable charges) as of the Business Day we receive proof of death and election of the payment method in Good Order at our Service Center. From the time the death benefit is determined until complete distribution is made, any amount in a Sub-Account will be subject to investment risk. As a result, the death benefit amount may increase or decrease over time. The risk is borne by the Beneficiary(ies).

The death benefit is the greater of your Contract Value, or your Purchase Payments reduced by an adjustment for withdrawals and any applicable charges.

We calculate the adjustment for withdrawals as follows:

- (1) the withdrawal amount, including any applicable charges;
- (2) divided by your Contract Value immediately prior to the withdrawal; with the result
- (3) multiplied by the most recently adjusted Purchase Payments.

The death benefit may be reduced by more than the actual dollar amount of the withdrawal. The reduction will be greater when the value of your Contract is lower due to market performance or other variables.

If you are participating in MassMutual Lifetime Income Protector, any portion of a withdrawal that is an excess withdrawal will result in an adjustment for withdrawals as just described. Any portion of a withdrawal that is not an excess withdrawal will reduce the death benefit on a dollar for dollar basis. See "Additional Benefits – MassMutual Lifetime Income Protector."

If you are participating in MassMutual Lifetime Payment Plus, any portion of a withdrawal that exceeds the Guaranteed Lifetime Withdrawal Amount or, if applicable, the Guaranteed Withdrawal Amount, will result in a proportional adjustment for withdrawals as just described. However, any portion of a withdrawal that is not in excess of the Guaranteed Lifetime Withdrawal Amount or Guaranteed Withdrawal Amount, if applicable, or which is part of a Required Minimum Distribution we calculate under an automatic distribution program, will reduce the death benefit on a dollar for dollar basis. See "Additional Benefits – MassMutual Lifetime Payment Plus."

We consider requests to apply part of your Contract Value to an Annuity Option as a withdrawal for purposes of calculating the death benefit amount.

See "Appendix D – Basic Death Benefit Examples" for examples pertaining to the operation of this death benefit.

References to Age

Age is as of the nearest birthday. For example, Age 80 is generally the period of time between age 79 years, 6 months and 1 day and age 80 and 6 months. See "Age."

Basic Death Benefit for Contracts Applied for Prior to 9/1/2007

(also available to all Contracts issued in states where Version 9/1/07 was unavailable)

You may only elect this feature if you are under Age 80 at the time you make the election.

The death benefit paid will be the amount calculated (and adjusted for any applicable charges) as of the Business Day we receive proof of death and election of the payment method in Good Order at our Service Center. From the time the death benefit is determined until complete distribution is made, any amount in a Sub-Account will be subject to investment risk. As a result, the death benefit amount may increase or decrease over time. The risk is borne by the Beneficiary(ies).

Prior to you reaching Age 80, the death benefit is the greater of your Contract Value, or your Purchase Payments reduced by an adjustment for withdrawals and any applicable charges. We calculate the adjustment for withdrawals as follows:

- (1) the withdrawal amount, including any applicable charges;
- (2) divided by your Contract Value immediately prior to the withdrawal; with the result
- (3) multiplied by the most recently adjusted Purchase Payments.

The death benefit may be reduced by more than the actual dollar amount of the withdrawal. The reduction will be greater when the value of your Contract is lower due to market performance or other variables.

At Age 80 and beyond, the value of the Basic Death Benefit is your Contract Value as of the Business Day we receive proof of death and election of the payment method in Good Order at our Service Center.

If there are Joint Owners of the Contract, we will use the Age of the oldest Joint Owner to determine the death benefit amount. If the Contract is owned by a non-natural person, we will use the Age of the Annuitant to determine the death benefit amount.

We consider requests to apply part of your Contract Value to an Annuity Option as a withdrawal for purposes of calculating the death benefit amount.

See “Appendix D – Basic Death Benefit Examples” for examples pertaining to the operation of this death benefit.

References to Age

Age is as of the nearest birthday. For example, Age 80 is generally the period of time between age 79 years, 6 months and 1 day and age 80 and 6 months. See “Age.”

Death Benefit Payment Options During the Accumulation Phase

The availability of certain death benefit options may be limited for Qualified Contracts in order to comply with RMD rules.

For Non-Qualified Contracts, each Beneficiary must elect the death benefit to be paid under one of the following options in the event that a death benefit becomes payable during the Accumulation Phase:

- **Option 1** – Lump sum payment of the death benefit within five years of the date of death.
- **Option 2** – Payment of the death benefit under an Annuity Option over the lifetime of the Beneficiary or over a period not extending beyond the life expectancy of the Beneficiary. Distribution must begin within one year of the date of any Owner’s death.

For Qualified Contracts, each Beneficiary must elect the death benefit to be paid under one of the following options in the event that a death benefit becomes payable during the Accumulation Phase:

- **Option 1** – Lump sum payment of the death benefit by the end of the calendar year that contains the tenth anniversary of your death (fifth anniversary of your death if you do not have a designated beneficiary as defined for purposes of IRC Section 401(a)(9), including where your beneficiary is your estate or certain trusts). If you die after reaching the age at which RMDs must begin, your beneficiary may not elect to defer payment of the lump sum beyond the end of the calendar year after the year of your death.
- **Option 2** – If the Beneficiary is your surviving spouse, or is not more than 10 years younger than you, payment of the death benefit under an Annuity Option over the lifetime of the Beneficiary or over a period not extending beyond the life expectancy of the Beneficiary. Distribution must generally begin by the end of the calendar year following the year of your death.

Additional Option for a Spouse Who is the Sole Primary Beneficiary

A surviving spouse who is the sole primary Beneficiary under a Contract that is either Non-Qualified or is held as a traditional IRA (including SEP and SIMPLE IRAs) or Roth IRA may elect Option 1, Option 2, or may elect to continue the Contract. Generally, if the Contract is continued then:

- the spouse’s initial Contract Value will be equal to the death benefit that would have been payable if the lump sum distribution had been elected;
- all applicable Contract features and benefits will be in the surviving spouse’s name; and
- the surviving spouse will exercise all of the Owner’s rights under the Contract.

Exceptions are as follows:

- if at the time the Owner purchased the Contract the surviving spouse was over the maximum Contract Issue Age, then the Contract cannot be continued;
- if at the time the Owner purchased the Contract the surviving spouse was over the maximum allowable age for electing a certain feature, then the feature is not available for continuance, but the Contract may be continued.

We further limit the surviving spouse’s rights applicable to continuing MassMutual Lifetime Income Protector and MassMutual Lifetime Payment Plus. See “Additional Benefits – MassMutual Lifetime Income Protector – Payment of the Contract’s Death Benefit and MassMutual Lifetime Income Protector” and “Additional Benefits – MassMutual Lifetime Payment Plus – Payment of the

Contract's Death Benefit and MassMutual Lifetime Payment Plus." If the sole primary beneficiary is a domestic partner or civil union partner, as defined under applicable state laws, we will treat him or her as a spouse for this provision, and he or she may elect to Continue the Contract as described herein. However, a domestic partner or civil union partner cannot elect to continue the Contract if it is a traditional IRA or Roth IRA. Since current federal tax law does not define a spouse to include a domestic partner or civil union partner, such domestic partner or civil union partner who elects to continue the Contract must still meet the distribution requirements of IRC Section 72(s). In order to meet these requirements, the amount of any gain in the Contract will become subject to income tax at the time the election to continue the Contract is made.

The right to continue the Contract by a surviving spouse, a domestic partner, or a civil union partner can only be exercised once while the Contract is in effect.

See "Taxes – Civil Unions and Domestic Partnerships" if you are in a domestic partnership or civil union.

Lump Sum Payments

If a lump sum payment is requested, we will pay the amount within seven calendar days after we receive due proof of death and election of the payment method in Good Order at our Service Center, unless we are required to suspend or delay payment.

Beneficiary IRA

Beneficiary, Inherited, Legacy or "Stretch" IRAs are all terms used to describe an IRA that is used exclusively to distribute death proceeds of an IRA or other qualified investment to the beneficiary over that beneficiary's life expectancy in order to meet the Required Minimum Distribution (RMD) rules. Upon the contract owner's death under an IRA or other qualified contract, an "Eligible Designated Beneficiary" may generally establish a Beneficiary IRA by either purchasing a new annuity contract or, in some circumstances, by electing the Beneficiary IRA payout option under the current contract. Until withdrawn, amounts in a Beneficiary IRA continue to be tax-deferred. Amounts withdrawn each year, including amounts that are required to be withdrawn under the RMD rules, are subject to tax.

If the contract owner died on or before December 31, 2019 (on or before December 31, 2021 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement), an individual designated beneficiary, and certain trusts as beneficiary, are treated as Eligible Designated Beneficiaries, and can elect to take distributions over their life expectancy (life expectancy of the oldest trust beneficiary).

However, if the contract owner dies on or after January 1, 2020 (on or after January 1, 2022 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement), only certain designated beneficiaries are treated as Eligible Designated Beneficiaries, and we will only offer the Beneficiary IRA payout option to a designated beneficiary who either (1) is the surviving spouse of the deceased qualified plan participant or IRA owner or, (2) is not more than 10 years younger than the deceased qualified plan participant or IRA owner. In the future, we may allow additional classes of Eligible Designated Beneficiaries to elect the Beneficiary IRA payout option.

See "Taxes – Required Minimum Distributions for Qualified Contracts" for more information.

Eligibility Requirements/Restrictions:

If a Beneficiary(ies) elects to establish a Beneficiary IRA after the death of the Owner, or if a Contract was issued as a Beneficiary IRA, the following rules apply:

- For a contract with a single Beneficiary, the Beneficiary will have the option of electing a Beneficiary IRA payout option under the Contract. Should the Beneficiary decide to elect the Beneficiary IRA payout option under the current Contract, any withdrawals in excess of the RMD will not be subject to a CDSC.
- For a contract with multiple Beneficiaries, a Beneficiary IRA payout option is not available under the Contract. However, a Beneficiary wishing to establish a Beneficiary IRA may elect a direct transfer of the lump sum death benefit to a Beneficiary IRA established for their benefit.
- If a contract was issued as a Beneficiary IRA, any withdrawals under a new Beneficiary IRA Contract in excess of the RMD may be subject to a CDSC as indicated by the terms of the Contract purchased.

- The source of funds to be invested must be from a traditional IRA, SEP IRA, SIMPLE IRA, Beneficiary IRA, TSA, 401(a) or a Qualified Employee Plan (includes Pension Plan, Money Purchase Pension Plan, Profit Sharing Plan, Keogh (HR10), Target Benefit Plan).
- The annuity contract will be titled in the Beneficiary's name as Beneficiary for the deceased Owner. The Beneficiary must be the Annuitant, and the Annuitant cannot be changed.
- For non-spousal Beneficiary IRAs, RMDs must begin by December 31st of the year following the year of the date of the Owner's death. For spousal Beneficiary IRAs, RMDs may be deferred until the year for which the original Owner would have been required to begin RMDs. The RMD amount will generally be calculated based on the Beneficiary's life expectancy and will be withdrawn from all investment accounts in which funds are invested in the ratio that your value in each bears to your Contract Value. If the original Owner died on or before December 31, 2019 (on or before December 31, 2021 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement), after RMDs were required to begin, and was younger than the Beneficiary, the RMD amount may be calculated based on the original Owner's life expectancy in the year of his or her death. If there is a Beneficiary IRA previously established with another carrier and an RMD is required in the current calendar year, we will process the RMD. If, however, an RMD is not required in the current calendar year, an RMD will not be processed until the year it is required.
- The Contract Value at time the Beneficiary IRA is established will be equal to either the death benefit that would have been payable to the Beneficiary if a lump sum distribution had been elected, or, if a Contract is issued as a Beneficiary IRA, the amount transferred to the Contract.
- If the original owner died before January 1, 2020 (before January 1, 2022 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement) and the Beneficiary is a trust, a Beneficiary IRA may only be established if the trust qualifies as a "see-through" trust. For see-through trusts, RMDs must be calculated based upon the life expectancy of the oldest trust beneficiary and the oldest trust beneficiary must be the Annuitant. In order to be a see-through trust, the trust must be valid under state law and be irrevocable, and all beneficiaries, current and future, must be identifiable from the trust instrument. If any beneficiary of the trust is not an individual, the trust is not a see-through trust and cannot establish a Beneficiary IRA. If the original Owner died after December 31, 2019 (after December 31, 2021 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement), we will not offer a Beneficiary IRA to a trust.
- Additional contributions cannot be applied to the Beneficiary IRA.
- If a beneficiary elects the Beneficiary IRA payout option under a Contract, upon the death of the Annuitant of the Beneficiary IRA, any remaining Contract Value will be paid to the succeeding Beneficiary in a lump sum or over the Annuitant's remaining life expectancy as determined under the applicable IRS table, but in no case may payments extend beyond the end of the calendar year that contains the tenth anniversary of the Annuitant's death.
- If a contract was issued as a Beneficiary IRA, upon the death of the Annuitant of the Beneficiary IRA, a death benefit, under the terms of the Contract, will be paid to the succeeding Beneficiary in a lump sum or over the Annuitant's remaining life expectancy as determined by the applicable IRS table, but in no case may payments extend beyond the end of the calendar year that contains the tenth anniversary of the Annuitant's death.
- If a Beneficiary IRA is established under a new or existing Contract described in this prospectus, the following optional features are unavailable: MassMutual Lifetime Income Protector, the Guaranteed Minimum Accumulation Benefit, MassMutual Lifetime Payment Plus, the Basic Guaranteed Minimum Income Benefit (Basic GMIB) and the Guaranteed Minimum Income Benefits called MassMutual Guaranteed Income Plus 5 (GMIB 5) and MassMutual Guaranteed Income Plus 6 (GMIB 6).
- Previously, the GMIB 5 and GMIB 6 were available if a Beneficiary IRA was established with a new annuity contract that offered the GMIB 5 and GMIB 6. If a Beneficiary IRA was established with a new annuity contract and the GMIB 5 or GMIB 6 was elected, the owner of that contract should understand how withdrawals in the contract may affect the feature benefits. For example, RMDs that exceed the current Contract Year interest earned on the GMIB value will reduce the GMIB value on a pro-rata basis. If a beneficiary established a Beneficiary IRA with a GMIB 5 or GMIB 6, the IRS may take the position that the inclusion of these benefits will not allow the contract to meet the RMD rules in certain instances without a complete surrender of the contract. Even if the RMD rules could be met, the value of either the GMIB 5 or GMIB 6 may be adversely impacted or eliminated if the beneficiary is required to commence RMDs prior to the time the GMIB 5 or GMIB 6 benefit could be exercised.
- A Beneficiary IRA may only be established by the Beneficiary of the IRA owner/qualified plan participant whose death triggered the RMD requirements of IRC Section 401(a)(9). A Beneficiary IRA may not be established as a "second generation" Beneficiary IRA by a successor Beneficiary.

- Joint Ownership of a Beneficiary IRA is not allowed.
- Additional rules may apply. Please consult your registered representative for further information.
- We have the right to modify, suspend or terminate the Beneficiary IRA program at any time without prior notification.

Beneficiaries should consult a qualified tax adviser for advice prior to establishing a Beneficiary IRA.

Death of Owner During the Income Phase

Upon any Owner's death during the Income Phase, if the Annuitant is still alive, the surviving Owner will retain the ownership of the Contract. If there is no surviving Owner, the Beneficiary will become the Owner. Any remaining Annuity Payments under the Annuity Option elected will continue to be paid at least as rapidly as under the method of distribution in effect at such Owner's death. For Qualified Contracts, the Beneficiary(ies) may be required to receive an adjusted payment stream in order to comply with RMD rules that apply upon the Owner/Annuitant's death. If the Beneficiary is not an "Eligible Designated Beneficiary" as defined by IRC Section 401(a)(9), Annuity Payments may only continue through the end of the calendar year that contains the tenth anniversary of the Owner/Annuitant's death, even if a longer Annuity Payment option was elected, including a Joint and Last Survivor Annuity Option where the Joint Annuitant is still living.

If you, or any Joint Owner, die during the Income Phase, the primary beneficiary will become the Owner. If any Joint Owner dies, we will treat the surviving Joint Owner as the primary beneficiary and treat any other beneficiary designation, on record at the time of death, as a contingent beneficiary, unless both Joint Owners have submitted a Written Request to our Service Center, in Good Order, requesting otherwise.

Death of Annuitant

If the Annuitant, who is not the Owner or Joint Owner, dies during the Accumulation Phase, you can name a new Annuitant subject to our approval. If you do not name an Annuitant within 30 calendar days of the death of the Annuitant, the oldest Owner will become the Annuitant. However, if the Owner is a non-natural person and the Annuitant dies, you may not name a new Annuitant. In this case we will treat the death of the Annuitant as the death of the Owner and pay the death benefit as described in the "Death of Owner During the Accumulation Phase" and "Death of Owner During the Income Phase" sections.

You cannot name a new Annuitant on Contract Value that has been applied to an Annuity Option. Upon the death of the last surviving Annuitant on or after the Annuity Date, the death benefit, if any, is as specified in the Annuity Option elected. We will pay death benefits at least as rapidly as under the method of distribution in effect at the Annuitant's death. For Qualified Contracts, the Beneficiary(ies) may be required to receive an adjusted payment stream in order to comply with RMD rules that apply upon the Owner/Annuitant's death. If the Beneficiary is not an "Eligible Designated Beneficiary" as defined by IRC Section 401(a)(9), Annuity Payments may only continue through the end of the calendar year that contains the tenth anniversary of the Owner/Annuitant's death, even if a longer Annuity Payment option was elected, including a Joint and Last Survivor Annuity Option where the Joint Annuitant is still living.

Due Proof of Death

For purposes of determining due proof of death, we require:

- a certified death certificate; or
- a certified decree of a court of competent jurisdiction as to the finding of death; or
- any other proof satisfactory to us.

Additional Benefits

Overview

For an additional charge or credit, certain features are available for you to elect. You must elect these features when you apply for a Contract unless otherwise stated. Except for MassMutual Lifetime Income Protector, if we allow you to elect an additional feature after you apply for a Contract, the effective date of your election will be on your Contract Anniversary date immediately following your election. If you elect an additional feature, it will replace the corresponding standard feature available under the Contract. Certain features may no longer be available or may not be available in all states.

Additional Features with an Additional Charge

Details regarding each feature appear later in this section.

Feature	Only Available to Elect at Contract Issue	Once Elected, Can be Cancelled
MassMutual Lifetime Income Protector (available on or after 1/11/2010, subject to state availability)	Yes Except as described under "Additional Benefits – MassMutual Lifetime Income Protector – Election After Contract Issue"	No
10%/20% Free Withdrawal Feature	Yes	No
Nursing Home Waiver Benefit	Yes	Yes
Annual Ratchet Death Benefit	No, you may elect at Contract issue or on any Contract Anniversary	Yes
Guaranteed Minimum Accumulation Benefit	Yes	Yes
Guaranteed Minimum Income Benefit (Basic GMIB, GMIB 5 and GMIB 6)	Yes	Yes
MassMutual Lifetime Payment Plus	Yes	Yes
Equalizer Benefit	Yes	Yes

Additional Feature Providing a Credit

Details regarding this feature appear later in this section.

Feature	Only Available to Elect at Contract Issue	Once Elected, Can be Cancelled
Nine Year Contingent Deferred Sales Charge Feature⁽¹⁾	Yes	No

⁽¹⁾ This feature does not result in an additional annual charge. However, it will result in a higher CDSC percentage in certain years and a longer CDSC period than the standard CDSC available under the Contract.

Additional Features Providing a Credit with No Additional Charge

Details regarding each feature appear later in this section.

Feature	Only Available to Elect at Contract Issue	Once Elected, Can be Cancelled
Contract Value Death Benefit (for Contracts issued in certain states and for all Contracts issued prior to 9/1/2007, the credit ends at Age 80)	No, you may elect at Contract issue or on any Contract Anniversary.	Yes
Electronic Document Delivery Credit	No, you may elect at any time.	Yes
Case Size Credit	You do not elect this feature. You are automatically eligible based on your Contract Value.	You do not elect or cancel this feature. You are automatically eligible based on your Contract Value.

Charges for Additional Features

This section pertains to all additional features except MassMutual Lifetime Income Protector, MassMutual Guaranteed Income Plus 5, MassMutual Guaranteed Income Plus 6, and MassMutual Lifetime Payment Plus. For an explanation of charges for those features see “Appendix L – Basic Guaranteed Minimum Income Benefit Examples,” “Appendix O – MassMutual Lifetime Payment Plus Examples” and “Appendix N – MassMutual Lifetime Income Protector Examples.”

If you elect one or more features that we offer with an additional charge, we will deduct an additional charge from your Contract Value. Charges for additional features are in addition to the standard Contract expenses.

Charges in the First Contract Year

If you elect a feature that we offer with an additional charge, we list that charge as a percentage. In the first Contract Year, we will deduct that percentage from your Purchase Payments received by us during the first Contract Year as each Purchase Payment is received. For example, when you purchase the Contract, if you elect two additional features and we charge 0.40% for one and 0.25% for the other, we will deduct from your Contract Value 0.65% of your initial Purchase Payment. We will also make a deduction from each subsequent Purchase Payment during the first Contract Year. The percent deducted will be adjusted to reflect the number of days remaining in the Contract Year. This charge will be in addition to charges for any other additional features elected and in addition to the standard Contract expenses.

Charges On and After Your First Contract Anniversary

At the end of your first Contract Year and at the end of every Contract Year thereafter, we will calculate the charge for each additional Contract feature based on your Contract Value at that time and we will deduct the charge on each Contract Anniversary. For example, if you elect two additional features and we charge 0.40% for one and 0.25% for the other, on each Contract Anniversary we will deduct from your Contract Value 0.65% of your Contract Value as of the day just prior to that anniversary. This charge will be in addition to charges for any other additional features elected and in addition to the standard Contract expenses.

We will deduct the entire charge proportionally as follows:

- (1) first, from the Sub-Accounts you are invested in as of the time we deduct the charge(s);
- (2) if you do not have sufficient value invested in the Sub-Accounts to deduct the entire charge(s) from the Sub-Accounts, then we will deduct the entire charge(s) from the Sub-Accounts plus The Fixed Accounts you are invested in as of the time we deduct the charge(s) (excluding the Long-Term Guarantee Fixed Accounts); or
- (3) if you do not have sufficient value invested in the Sub-Accounts and The Fixed Accounts (excluding the Long-Term Guarantee Fixed Accounts) to deduct the entire charge(s) from those investment choices, then we will deduct the entire charge(s) from the Sub-Accounts plus all of The Fixed Accounts you are invested in as of the time we deduct the charge(s).

We calculate a charge assessed out of The Fixed Account and Long-Term Guarantee Fixed Accounts on a first-in, first out basis. In other words, we assess the charge attributed to the oldest Purchase Payments first; then we assess the charge attributed to the next oldest Purchase Payment; and so on.

When Do Charges End?

To answer this question, read the detail in this section for each specific feature. Certain features you can cancel effective on any Contract Anniversary and we will no longer deduct a charge after that time. Other features expire after a certain number of Contract Years, at which time we will no longer deduct a charge. If you surrender your Contract, we will not reimburse you for any prepaid charge for an additional feature.

Credits for Additional Features

Certain features of this Contract involve the payment of a credit. If you elect any of these features, your Contract expenses may be higher with the feature than without them. The amount of any credits may be more than offset by the charges for your elected features.

Except for the Electronic Document Delivery Credit described in “Additional Benefits – Electronic Document Delivery Credit,” we calculate all credits based on your Contract Value as of the end of the Contract Year. For example, if you elect an additional feature and we credit you 0.05%, on each Contract Anniversary following your election, we will credit your Contract Value with 0.05% of your Contract Value as of the day just prior to that anniversary. We will apply credits proportionally to the Sub-Accounts that you are invested in as of the date we calculate the credit. If you do not have any Contract Value in the Sub-Accounts at such time, the credit will be applied to a money market Fund.

No credits will be provided should you surrender your Contract prior to your Contract Anniversary.

These credit amounts may be subject to the assessment of a Contingent Deferred Sales Charge upon withdrawal or if you elect to receive an Annuity Payment.

Nine Year Contingent Deferred Sales Charge Feature

For additional detail see “Additional Benefits – Credits for Additional Features” and “Appendix E – Contingent Deferred Sales Charge (CDSC) Examples.”

The Contract has a standard seven year CDSC schedule. You may have elected a nine year CDSC schedule instead of the standard seven year CDSC schedule when your Contract was issued. If you so elected, we will credit your Contract in an amount equal to 0.10% of your Contract Value as of the end of each Contract Year. We will apply this credit while the CDSC schedule is in effect. You may only elect this additional feature at the time you apply for a Contract. Once elected you cannot cancel this feature.

Election of the nine year CDSC feature will result in a higher CDSC percentage in certain years and a longer CDSC period than the standard CDSC available under the Contract.

The nine year CDSC schedule is as follows:

CDSC – 9-Year Schedule	
Contract Year When Withdrawal is Made or Contract Value is Applied to Annuity Option E	CDSC (as a percentage of amount withdrawn or applied to Annuity Option E)
1 st Year	8%
2 nd Year	8%
3 rd Year	7%
4 th Year	6%
5 th Year	5%
6 th Year	4%
7 th Year	3%
8 th Year	2%
9 th Year	1%
10 th Year and later	0%

We will not impose a CDSC upon application of the Contract Value to a Period Certain Annuity under Annuity Option E of at least ten years. See “Expenses – Contingent Deferred Sales Charge” for more information.

10%/20% Free Withdrawal Feature

For additional detail on charge deduction and examples of the operation of the feature see “Additional Benefits – Charges for Additional Features” and “Appendix F – Free Withdrawal Amount (FWA) Examples.”

The Contract has a standard 10% free withdrawal provision. For an additional charge of 0.25% of Contract Value on an annual basis, you may have elected the following free withdrawal provision instead of the standard 10% free withdrawal provision. We may increase this charge, but it will never exceed 0.35% of Contract Value on an annual basis.

In your first Contract Year, you may withdraw, without incurring a CDSC, up to 10% of your Purchase Payments reduced by any free withdrawal amount previously taken during the Contract Year. Beginning in the second Contract Year, you may withdraw up to 20% of your Contract Value as of the end of the previous Contract Year, plus 20% of any Purchase Payment received in the current Contract Year, reduced by any free withdrawal amount previously taken during the current Contract Year.

You may take your free withdrawal amount in multiple withdrawals each Contract Year. You may only elect this additional feature at the time you apply for a Contract. We will assess the charge for this feature while your CDSC schedule is in effect. Once elected you cannot cancel this feature.

If you are participating in MassMutual Lifetime Income Protector, and all or a portion of a free withdrawal is an excess withdrawal as defined in “Additional Benefits – MassMutual Lifetime Income Protector,” the excess withdrawal will negatively impact the MassMutual Lifetime Income Protector benefit.

Nursing Home Waiver Benefit

Also known in certain states as the Nursing Home Waiver of Contingent Deferred Sales Charge Rider. This rider may not be available in all states. See “Appendix Q – State Variations of Certain Contract Features.”

For additional detail on charge deduction and examples of the operation of this benefit see “Additional Benefits – Charges for Additional Features” and “Appendix G – Nursing Home Waiver Benefit Example.”

For an additional charge, you may have elected the Nursing Home Waiver Benefit. If you elected the Nursing Home Waiver Benefit, we currently deduct an additional charge of 0.05% of Contract Value on an annual basis. We may increase this charge at any time while you own the Contract, but the charge will never exceed 0.10% of Contract Value on an annual basis. We will assess this charge while the CDSC schedule is in effect.

You may only elect this additional feature at the time you apply for a Contract. You may cancel this feature at any time. The cancellation will be effective on the Contract Anniversary following your request.

If you elected this feature, you may withdraw all or a portion of your Contract Value without incurring a Contingent Deferred Sales Charge if we receive written confirmation in Good Order at our Service Center that you (or an Annuitant, if the Owner is a non-natural person) have been admitted to a licensed nursing care facility after your purchase of the Contract subject to the following requirements:

- You are past your first Contract Year.
- If you resided in a licensed nursing care facility within two years prior to Contract issue, the benefit is not available to you; however, for Contracts issued in New York, if the waiver is unavailable to you for this reason, you will automatically become eligible two years following the date of discharge from a licensed nursing care facility.
- Your stay in a licensed nursing care facility is prescribed by a physician and is medically necessary.
- You provide us with written documentation satisfactory to us that confirms that you still reside in a licensed nursing care facility every time you request a partial withdrawal.
- You make each withdrawal request while you are presently confined in a licensed nursing care facility for a period of not less than 90 days.

You may not participate in the Systematic Withdrawal Program if you elected the Nursing Home Waiver Benefit and we are currently waiving the Contingent Deferred Sales Charge in accordance with that benefit.

A licensed nursing care facility is an institution licensed by the state in which it is located to provide skilled nursing care, intermediate nursing care, or custodial nursing care.

Additional Death Benefit Features

Overview

The death benefit amount depends upon the death benefit feature in effect at the time of your death or, if the Contract is owned by a non-natural entity, the Annuitant's death. The Contract offers three death benefit features:

- Basic Death Benefit (described in "Death Benefit");
- Annual Ratchet Death Benefit;
- Contract Value Death Benefit.

Certain additional death benefit features may not be available in all states. You cannot elect the Annual Ratchet Death Benefit if you are participating in MassMutual Lifetime Income Protector. Some death benefit features are not available if you are a certain age. These details are included in our description of each death benefit feature.

Only one death benefit feature is available at a time. We do not assess an additional charge for the Basic Death Benefit. However, we will provide your Contract with a credit or assess an additional charge to your Contract if you elect one of the additional death benefit features. You may change your death benefit feature at any time and the change will be effective on your following Contract Anniversary.

If your death benefit amount is greater than your Contract Value at the time you change death benefit features, the change in death benefit features may result in a decrease in your death benefit amount. Please contact your registered representative for more information on the impact of changing death benefit features after we issue your Contract.

Annual Ratchet Death Benefit

For additional detail on charge deduction and examples of the operation of this benefit see “Additional Benefits – Charges for Additional Features” and “Appendix H – Ratchet Death Benefit Example.”

For an additional charge, at time of Contract issue or effective on any Contract Anniversary, you may elect the Annual Ratchet Death Benefit. If you elected this feature, we currently deduct an additional charge of 0.40% of Contract Value. We may increase this charge, but it may not exceed 0.90% of Contract Value. If you are participating in MassMutual Lifetime Income Protector, you cannot elect this death benefit.

The death benefit paid will be the amount calculated (and adjusted for any applicable charges) as of the Business Day we receive proof of death and election of the payment method in Good Order at our Service Center.

The amount of the Annual Ratchet Death Benefit will be the greatest of:

- your Contract Value; or
- the amount of Purchase Payments you have made to the Contract reduced by an adjustment for withdrawals; or
- the highest anniversary value reduced by an adjustment for withdrawals and increased by any Purchase Payments.

The Highest Anniversary Value

If you elected the Annual Ratchet Death Benefit when we issued your Contract, your initial highest anniversary value is equal to your initial Purchase Payment. If you make your election after we issue your Contract, your initial highest anniversary value equals the lesser of your Contract Value or your Purchase Payments less withdrawals as of the date the election is effective.

On each Contract Anniversary prior to Age 80, the highest anniversary value will be recalculated and set to equal the greater of:

- the most recently calculated highest anniversary value; or
- your Contract Value on the date of the recalculation.

On dates other than the Contract Anniversary, we will recalculate the highest anniversary value each time you make a Purchase Payment or a withdrawal. We will increase it by any Purchase Payments and reduce it by an adjustment for any withdrawals.

At Age 80 and above, the highest anniversary value will no longer change and will remain as last calculated except we will increase it if you make subsequent Purchase Payments and we will adjust it for any subsequent withdrawals. Age 80 refers to the oldest Owner's Age or, if the Owner is a non-natural person, the oldest Annuitant's Age.

References to Age

Age is as of the nearest birthday. For example, Age 80 is generally the period of time between age 79 years, 6 months and 1 day and age 80 and 6 months. See “Age.”

Adjustment for Withdrawals

When we adjust Purchase Payments for subsequent withdrawals we look at the withdrawal amount, divide it by your Contract Value just prior to the withdrawal and then multiply that by the most recently adjusted Purchase Payments prior to the withdrawal.

When we adjust the highest anniversary value for subsequent withdrawals we look at the withdrawal amount, divide it by your Contract Value just prior to the withdrawal and then multiply that by the most recently calculated highest anniversary value.

When we adjust Purchase Payments for subsequent withdrawals, if you have elected MassMutual Lifetime Payment Plus, any portion of a withdrawal that exceeds the Guaranteed Lifetime Withdrawal Amount or, if applicable, the Guaranteed Withdrawal Amount, will result in a proportional adjustment for withdrawals as just described. However, any portion of a withdrawal that is not in excess of the Guaranteed Lifetime Withdrawal Amount or Guaranteed Withdrawal Amount, if applicable, or which is part of a Required Minimum Distribution we calculate under an automatic distribution program, will reduce the Purchase Payments

on a dollar for dollar basis. See “Appendix O – MassMutual Lifetime Payment Plus Examples.”

The death benefit may be reduced by more than the actual dollar amount of the withdrawal. The reduction will be greater when the value of your Contract is lower due to market performance or other variables.

We consider requests to apply part of your Contract Value to an Annuity Option as a withdrawal for purposes of calculating the death benefit amount.

Cost of the Annual Ratchet Death Benefit

If you elect the Annual Ratchet Death Benefit, we will deduct an additional charge of 0.40% of Contract Value on an annual basis while the death benefit feature is in effect. We may increase this charge at any time while you own the Contract, but the percentage will never exceed 0.90% of Contract Value on an annual basis.

Contract Value Death Benefit

For additional detail see “Additional Benefits – Credits for Additional Features” and “Appendix I – Contract Value Death Benefit Example.”

If you elect the Contract Value Death Benefit, we currently calculate a credit in the amount of 0.05% of your Contract Value as of the end of each Contract Year while this death benefit feature is in effect. You may elect this feature at the time of Contract issue or effective on a Contract Anniversary. We apply the credit on your immediately following Contract Anniversary. We may reduce this credit at any time while you own the Contract, but the credit will never be less than 0.02%. The Contract Value Death Benefit is equal to your Contract Value as of the Business Day we receive proof of death and election of the payment method in Good Order at our Service Center.

For Contracts issued in certain states and for all Contracts issued prior to 9/1/07, if you or the oldest Joint Owner (or the Annuitant, if the Contract is owned by a non-natural person) are Age 80 or beyond, we do not provide an annual credit to your Contract Value.

References to Age

Age is as of the nearest birthday. For example, Age 80 is generally the period of time between age 79 years, 6 months and 1 day and age 80 and 6 months. See “Age.”

Electronic Document Delivery Credit

We will provide an annual \$24 credit to your Contract on your Contract Anniversary if you are participating in our e-Documents Program as of your Contract Anniversary. Participation in our e-Documents Program will provide you with documents related to your Contract in an electronic format rather than paper format. Examples of these documents include the prospectus, prospectus supplements, and annual and semiannual reports of the underlying funds.

For instructions on how to participate, call our Service Center.

We will pay the electronic document delivery credit from the expense savings that result from the delivery of documents related to the Contract in electronic format rather than paper format.

The electronic document delivery credit may be subject to the assessment of a CDSC upon withdrawal or if you elect to receive an Annuity Payment.

You may discontinue your participation in our e-Documents Program at any time if you wish to receive these documents in paper format rather than electronic format.

We reserve the right to continue, modify or terminate this credit feature at any time.

Case Size Credit

For additional detail see “Additional Benefits – Credits for Additional Features.”

We will provide a credit to your Contract if it exceeds a certain average Contract Value as of the end of each Contract Year. We will determine the average Contract Value for your Contract by taking the average of your Contract Value at the end of each Contract Year quarter during the current Contract Year.

We will provide a 0.05% credit to your Contract on your Contract Anniversary if your average Contract Value is at least \$250,000 and less than \$1 million as of the end of the immediately preceding Contract Year.

We will provide a 0.10% credit to your Contract on your Contract Anniversary if your average Contract Value is at least \$1 million as of the end of the immediately preceding Contract Year.

Guaranteed Minimum Accumulation Benefit (GMAB)

See sub-section “Cost of the GMAB” for details about charges for this feature. For additional detail on charge deduction see “Additional Benefits – Charges for Additional Features.” For examples of the operation of this benefit, see “Appendix J – Guaranteed Minimum Accumulation Benefit (10-Year Benefit) Examples” and “Appendix K – Guaranteed Minimum Accumulation Period (20-Year) Examples.”

What is the GMAB?

If you elected the GMAB, we guarantee that at the end of your benefit period your Contract Value will equal no less than a specified amount called the GMAB value. The GMAB may provide protection in the event of lower Contract Values that may result from the investment performance of the Contract.

When you elected the GMAB, you chose one of two available benefit periods: the 10 year benefit period with reset option or the 20 year benefit period. You may only make this choice at the time your Contract is issued.

10 Year Benefit Period with Reset Option

You may have elected a 10 year benefit period with an option to reset. This benefit period will initially end upon your tenth Contract Anniversary, with the option to reset the benefit period as of your second Contract Anniversary and each subsequent Contract Anniversary up to and including the end of the benefit period. See The Reset Option for any restrictions associated with resetting the 10 Year Benefit Period.

The Reset Option

The option to reset means that on your second Contract Anniversary, and each subsequent Contract Anniversary while a benefit period is in effect, you may elect to reset your GMAB value. If, at the time of reset, your Contract Value exceeds the GMAB value, then we will reset your GMAB value so it equals your Contract Value as of the close of the NYSE at the end of the last Business Day prior to the Contract Anniversary on which you elect to reset. If your GMAB value is reset, your 10 year benefit period will start over again. For example, if you reset your GMAB value as of your second Contract Anniversary, your 10 year benefit period will end on your 12th Contract Anniversary.

If you want to request a reset for your upcoming Contract Anniversary, you must submit a Written Request in Good Order to our Service Center within 60 calendar days prior to the close of the NYSE on that Contract Anniversary. If we receive your request outside of the 60 day window, your request will not be implemented.

If you request a reset and on the date we are to implement the reset your Contract Value is less than the current GMAB value, the reset will not occur and the existing benefit period and GMAB value will remain in place.

After you reach Age 90 (Age 80 for Contracts issued in New York), the reset option is no longer available to you.

If we issued your Contract prior to June 1, 2005, and you elected the GMAB feature when your Contract was issued, your 10 year GMAB feature will remain the same except now it will include the reset option.

20 Year Benefit Period

You may have elected a 20 year benefit period (26 year benefit period for Contracts issued in New York). This option does not include a reset feature and it is not available in Contracts issued prior to June 1, 2005.

Allocation Restrictions

If you elected the GMAB, you must participate in an approved Asset Allocation Program. See "Transfers and Transfer Programs – Asset Allocation Programs."

If you elected the GMAB, you cannot participate in the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, a DCA Fixed Account or the Automatic Rebalancing Program. Additionally, you cannot make allocations to The Fixed Accounts.

Additional Restrictions

If you elected the GMAB, you may not elect a Guaranteed Minimum Income Benefit, MassMutual Lifetime Payment Plus or MassMutual Lifetime Income Protector.

Eligibility for the GMAB Value

You will be eligible to receive the GMAB value if:

- (1) you elected the GMAB at time of Contract issue and you do not cancel the GMAB;
- (2) you remain in your Contract until the end of your benefit period and do not apply all of your Contract Value to an Annuity Option before the end of your benefit period; and
- (3) you participated in an approved Asset Allocation Program at the time of Contract issue, and remain in the program until the end of your benefit period. (See "Transfers and Transfer Programs – Asset Allocation Programs").

If you elected the GMAB, but items (2) and (3) are not met, you will not be eligible to receive the GMAB value, even though you have paid for the feature. At the end of your benefit period the GMAB will terminate. No benefits or charges will occur thereafter.

How Do We Calculate the GMAB Credit and the GMAB Value?

If we have never applied a reset, then your GMAB credit equals the difference between:

- A) your Contract Value at the end of the benefit period; and
- B) the GMAB value.

If you elected the 10 year benefit period the GMAB value equals the amount of Purchase Payments you made to the Contract during the first two Contract Years adjusted for withdrawals.

If you elected the 20 year benefit period (26 year benefit period for Contracts issued in New York) the GMAB value equals the amount of Purchase Payments you made to the Contract during the first two Contract Years multiplied by two and adjusted for withdrawals.

If B is greater than A, then we will credit your Contract Value with the difference. If B is equal to or less than A, we will not credit your Contract Value.

If any Purchase Payments were made after the first two Contract Years, then we adjust the calculation by determining what percentage of all Purchase Payments were made in the first two Contract Years and then we multiply A by that percentage. See "Appendix J – Guaranteed Minimum Accumulation Benefit (10 Year Benefit) Examples – Example 4."

If we previously applied a reset, then your GMAB credit equals the difference between:

X) your Contract Value at the end of the benefit period; and

Y) the GMAB Value. The GMAB Value equals your Contract Value as of the most recent reset adjusted for subsequent withdrawals.

If Y is greater than X, then we will credit your Contract Value with the difference. If Y is equal to or less than X, we will not credit your Contract Value.

If any Purchase Payments were made after the most recent reset, we multiply X by the following percentage:

(1) your Contract Value as of the most recent reset; divided by

(2) your Contract Value as of the most recent reset plus any subsequent Purchase Payments.

Adjustment for Withdrawals

For all benefit periods, the adjustment for withdrawals is calculated as follows:

(1) the withdrawal amount, including any applicable charges; divided by

(2) your Contract Value immediately prior to the withdrawal; with the result multiplied by

(3) the most recently calculated GMAB value.

The GMAB value may be reduced by more than the actual dollar amount of the withdrawal. The reduction will be greater when the value of your Contract is lower due to market performance or other variables.

We consider a request to apply part of your Contract Value to an Annuity Option as a withdrawal for purposes of calculating the GMAB value.

What Happens at the End of the Benefit Period?

At the end of the benefit period, we calculate the GMAB value and the GMAB credit. We credit your Contract Value if the GMAB credit is greater than zero.

At the end of the benefit period your election of the GMAB terminates with no benefits or charges occurring thereafter.

For additional information see "Appendix J – Guaranteed Minimum Accumulation Benefit (10 Year Benefit) Examples."

Payment of Any Credit

Any credit paid due to your election of GMAB will be applied proportionally to the Funds you are invested in when we apply the credit. If you are not invested in any Funds at that time, we will automatically apply the credit to a money market Fund. Electing GMAB does not guarantee a credit will be paid.

Cost of the GMAB

If you elected the GMAB, we will deduct an additional charge from your Contract Value. The charge varies by Issue Date: 0.95% of Contract Value on an annual basis (for Contracts issued on or after 5/1/2010); 0.45% of Contract Value on an annual basis (for Contracts issued on or after 9/1/2006 and prior to 5/1/2010); and 0.35% of Contract Value on an annual basis (for Contracts issued prior to 9/1/2006). We may increase this charge at any time while you own the Contract, but the charge will never exceed 1.00% of Contract Value on an annual basis. At the end of the benefit period the charge will be discontinued. If you elect to discontinue the GMAB and its associated benefit, the charge will be discontinued when we receive your request in Good Order at our Service Center, and we will apply a proportionate credit of the remaining prepaid charge to your Contract Value. For additional detail on charges for this feature see "Additional Benefits – Charges for Additional Features."

How to Elect the GMAB

To elect the GMAB, you must have:

- elected the GMAB at the time your Contract was issued; and
- elected to participate in an approved Asset Allocation Program (see “Transfers and Transfer Programs – Asset Allocation Programs”).

Additionally, at the time we issue your Contract, you must meet the age requirements as follows:

To have elected the 10 year benefit period you must not have attained Age 90 (Age 80 for Contracts issued in New York).

To have elected the 20 year benefit period (26 year benefit period for Contracts issued in New York) you must not have attained Age 80 (Age 64 for Contracts issued in New York).

Once we issue your Contract, you cannot elect the GMAB.

Canceling the GMAB

We will terminate your election of the GMAB on the Business Day we receive our form in Good Order at our Service Center. We will apply a proportionate credit of the remaining prepaid charge to your Contract Value. Once the GMAB is terminated, it cannot be re-elected.

Important GMAB Considerations

This benefit may not be appropriate for all Owners. You should understand the GMAB completely before you elect this benefit feature. Please consult with a qualified financial professional when you are evaluating the GMAB and all other aspects of the Contract.

The GMAB does not in any way guarantee the performance of any of the investment choices available under the Contract.

The restriction in the amount and type of investment choices that are available to you under the GMAB is intended to help us manage the risk that we will be required to credit your Contract Value as a result of the GMAB.

Consult a tax adviser before considering the GMAB in conjunction with a Qualified Contract because any minimum distribution requirements may negatively impact the benefit.

Any Purchase Payments made after the second Contract Year will also be subject to the cost of the GMAB, without a corresponding increase in the benefit. Likewise, such Purchase Payments may ultimately reduce the value of the benefit.

Withdrawals will negatively impact the GMAB value. The GMAB value may be reduced by more than the actual dollar amount of the withdrawal. The reductions will be greater when the value of your Contract is lower than the GMAB value due to market performance or other variables. See “Appendix J – Guaranteed Minimum Accumulation Benefit (10 Year Benefit) Examples – Example 3.”

To receive any potential benefit from this feature, you must participate in the GMAB for the full benefit period.

Guaranteed Minimum Income Benefit (GMIB)

If you applied for your Contract before April 1, 2009 and you elected a GMIB feature, see the chart below to identify which GMIB feature(s) were available to you when we issued your Contract.

For examples of the operation of this benefit, please see “Appendix L – Basic Guaranteed Minimum Income Benefit Examples.”

GMIB 5	The GMIB 5 is no longer available. GMIB 5 was available if you applied for your Contract from 9/1/2007 to 3/31/2009 (subject to state availability). Certain aspects of the GMIB 5 vary depending on when we issued your Contract. See “GMIB 5 and GMIB 6 – 2008 and Pre-2008 Version.”
GMIB 6	The GMIB 6 is no longer available. GMIB 6 was available if you applied for your Contract from 9/1/2007 to 12/2/2008 (subject to state availability). Certain aspects of the GMIB 6 vary depending on when we issued your Contract. See “GMIB 5 and GMIB 6 – 2008 and Pre-2008 Version.”
Basic GMIB	The Basic GMIB is no longer available. The Basic GMIB was available if you applied for your Contract prior to 9/1/2007 (subject to state availability) or on or after 9/1/2007 in a state where GMIB 5 and GMIB 6 were unavailable.

Important GMIB Considerations

- Withdrawals reduce the value of the GMIB. To understand the impact of withdrawals on the GMIB value see “Additional Benefits – GMIB 5 and GMIB 6 (MassMutual Guaranteed Income Plus 5SM and MassMutual Guaranteed Income Plus 6SM) – Adjustment for Withdrawals” or “Additional Benefits – Basic GMIB – How is the GMIB Value Calculated?”
- This feature may not be appropriate for all Owners. You should understand the GMIB completely before you elect this feature.
- The GMIB does not in any way guarantee the performance of any of the investment choices available under this Contract.
- For the GMIB 5 and GMIB 6, any Purchase Payments made after the second Contract Year if the GMIB value has not been reset, or after the most recent reset of the GMIB value, will not automatically increase the GMIB value. As a result, if you apply your full GMIB value to an Annuity Option, there may be Contract Value remaining in the Accumulation Phase if you have made any Purchase Payments after the second Contract Year and did not reset the GMIB value or if you made any Purchase Payments after your most recent reset of the GMIB value. Please see “Example 8” in “Appendix M” to see the impact of Purchase Payments made after a reset of the GMIB value when the full GMIB value is applied to an Annuity Option.
- For the Basic GMIB, any Purchase Payments made after the second Contract Year will not increase the GMIB value. As a result, if you apply your full GMIB value to an Annuity Option, there may be Contract Value remaining in the Accumulation Phase if you made any Purchase Payments after the second Contract Year.
- Because the charge for the GMIB 5 and GMIB 6 is a percentage of the GMIB value, an increase in the GMIB value will result in an increase in the cost of the feature.

Consult a tax adviser before considering the GMIB in conjunction with a Qualified Contract because minimum distribution requirements may negatively impact the benefit and may limit the Annuity Options available to you.

- Please consult with a qualified financial professional when you are evaluating the GMIB and all other aspects of the Contract.

GMIB 5 and GMIB 6 (MassMutual Guaranteed Income Plus 5SM and MassMutual Guaranteed Income Plus 6SM)

See sub-section “Cost of GMIB 5 and GMIB 6” for detail about charges for this feature.

GMIB 5 was available if you applied for your Contract from September 1, 2007 to March 31, 2009 (subject to state availability). GMIB 6 was available if you applied for your Contract from September 1, 2007 to December 2, 2008 (subject to state availability). Certain aspects of the GMIB 5 and GMIB 6 vary depending on when we issued your Contract. See “GMIB 5 and GMIB 6 – 2008 and Pre-2008 Version.”

What are GMIB 5 and GMIB 6?

GMIB 5 and GMIB 6 are features you may have elected when we issued your Contract. Each sets a minimum floor for a future amount that you may apply to an Annuity Option. We call that amount the GMIB value.

Examples

For examples of how the benefit may work see “Appendix M – MassMutual Guaranteed Income Plus 5 Examples – 2008 Version.”

2008 and Pre-2008 Versions

This prospectus describes two versions of the Transitions Select Contract: the 2008 Version (applied for on or after 9/8/2008, subject to state availability); and the Pre-2008 Version (applied for prior to 9/8/2008 or in states where the 2008 Version was unavailable). In this section, we will note when there are differences between the 2008 Version of GMIB 5 and GMIB 6 and the Pre-2008 Version.

Benefit Waiting Period

You are not eligible to apply your GMIB value to an Annuity Option until after your benefit waiting period. The benefit waiting period equals ten Contract Years, so you become eligible to apply your GMIB value to an Annuity Option:

- on your tenth Contract Anniversary; or
- if your GMIB value is reset, on the tenth Contract Anniversary following the most recent reset.

Your first Contract Anniversary is one year from the date we issued your Contract.

For additional eligibility requirements see “GMIB 5 and GMIB 6 – Eligibility for the GMIB Value.”

How is the GMIB Value Calculated?

When we issue your Contract, your GMIB value will equal your initial Purchase Payment increased by a compound annual interest rate of 5% for GMIB 5 or 6% for GMIB 6.

Additional Purchase Payments made within the first two Contract Years are added to the GMIB value, increased on a pro-rated basis from the date of receipt until the end of that Contract Year by an annual interest rate of 5% for GMIB 5 or 6% for GMIB 6. If you make a withdrawal, we reduce your GMIB value by an adjustment for withdrawals.

On each Contract Anniversary prior to the Contract Anniversary on which the GMIB value is fully annuitized, we will increase your GMIB value by an annual interest rate of 5% for GMIB 5 or 6% for GMIB 6 and continue to make any adjustment for withdrawals. If your GMIB value is reset, we recalculate your GMIB value as described in “GMIB 5 and GMIB 6 – What Happens On A Reset Date?” If your GMIB value is reset, then on that date we will use the new GMIB value when calculating the 5% or 6% increase. Contract Anniversary values are that day’s values as of the close of the NYSE.

Discontinuation of Crediting of Annual Interest to the GMIB Value

Crediting of the annual interest rate to the GMIB value for the GMIB 5 and GMIB 6 will only be discontinued:

- on the Contract Anniversary following the Annuitant attaining age 90 (for the 2008 Version) or 85 (for the Pre-2008 Version);
- if the Contract Value is fully annuitized;
- if the GMIB value is fully annuitized;
- if the GMIB 5 or GMIB 6 is terminated; or
- if the Contract is terminated.

(The term “fully annuitized” means “fully applied to an Annuity Option.”)

Adjustment for Withdrawals

If you make a withdrawal, we recalculate the GMIB value by making an adjustment for withdrawals. There are two types of adjustments for withdrawals:

Dollar for Dollar Adjustment

During each Contract Year, we will lower your GMIB value for each dollar that you withdraw up to and equal to the current Contract Year interest credited on your GMIB value.

Pro-Rata Adjustment

During each Contract Year, for any amount you withdraw that exceeds the current Contract Year interest credited on your GMIB value, the GMIB value will be further reduced by a pro-rata adjustment. Such a withdrawal will negatively impact your GMIB value. We use the percentage of Contract Value withdrawn to lower the GMIB value by the same percentage. This may result in a larger reduction in the GMIB value than the actual dollar amount of the withdrawal.

The following is an example of a pro-rata adjustment to the GMIB value:

The values shown are based on the following assumptions:

- the Owner is Age 60 when we issue the Contract;
- the Annuitant and the Owner are the same person;
- the initial Purchase Payment is equal to \$100,000; and
- there is a hypothetical rate of return such that the Contract Value in Contract Year 5 prior to the withdrawal is equal to \$127,322

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMIB Value
1	61	\$100,000	\$ 0	\$104,916	\$105,000
2	62		0	110,074	110,250
3	63		0	115,485	115,763
4	64		0	121,161	121,551
5	65		12,000	115,322	115,613
6	66		0	120,791	121,394

The example shows the following:

- On the Issue Date, the GMIB value is equal to the initial Purchase Payment increased by 5%.
- Each Contract Year the GMIB value is increased by 5%.
- A withdrawal of \$12,000 is taken in Contract Year 5. Because this withdrawal is greater than the interest credited to the GMIB value during the current Contract Year, the GMIB value is:
 - reduced dollar for dollar up to the interest credited during the current Contract Year; and
 - reduced in direct proportion to the Contract Value reduction for the amount of the withdrawal greater than the GMIB interest credited during the current Contract Year.
- The GMIB interest credited during Contract Year 5 is equal to \$6,077.
- The withdrawal amount is equal to \$12,000.
- The excess withdrawal amount is equal to \$5,923 (\$12,000 – \$6,077).
- The Contract Value prior to the excess withdrawal is equal to \$121,245 (\$127,322 – \$6,077).
- The Contract Value after the excess withdrawal is equal to \$115,322 (\$121,245 – \$5,923).
- The GMIB value prior to the withdrawal is equal to \$127,628.
- The GMIB value prior to the excess withdrawal is equal to \$121,551 (\$127,628 – \$6,077).
- The GMIB value after the excess withdrawal = the GMIB value prior to the excess withdrawal – ((excess withdrawal / Contract Value prior to the excess withdrawal) x (the GMIB value prior to the excess withdrawal)).
- The GMIB value = \$121,551 – ((\$5,923 / \$121,245) x (\$121,551)) = \$121,551 – \$5,938 = \$115,613.

We consider requests to apply part of your Contract Value to an Annuity Option as a withdrawal for purposes of calculating the GMIB value.

Withdrawals may be subject to a CDSC.

The Reset Date for the 2008 Version

(for Contracts applied for on or after 9/8/2008, subject to state availability). For the 2008 Version a reset date will automatically occur on your first Contract Anniversary and each subsequent Contract Anniversary, unless you request otherwise in writing. Your Written Request must be received in Good Order at our Service Center prior to the close of the NYSE on the Business Day before your Contract Anniversary for the request to be effective on that anniversary. Following the anniversary once the Annuitant is over age 80, the reset option is no longer available so there are no longer reset dates.

The Reset Date for the Pre-2008 Version

(for Contracts applied for prior to 9/8/2008 or in states where the 2008 Version was unavailable). For the Pre-2008 Version we will not schedule an initial reset date until you request one. Once you request an initial reset date we will automatically schedule future reset dates for each subsequent Contract Anniversary unless you request otherwise in writing. Reset dates may occur on your second Contract Anniversary and any subsequent Contract Anniversary. To request a reset or to cancel a reset a Written Request must be received in Good Order at our Service Center prior to the close of the NYSE on the Business Day before your Contract Anniversary for the request to be effective on that anniversary. Following the anniversary once the Annuitant is over age 75, the reset option is no longer available so there are no longer reset dates.

What Happens on a Reset Date?

As of the close of the NYSE on the Business Day prior to the reset date, we will compare your GMIB value to your Contract Value.

- If at the close of the NYSE on the Business Day just prior to the reset date your Contract Value exceeds the GMIB value, then we will reset your GMIB value by increasing it to equal that Contract Value. The increase will occur on the reset date. Additionally, the following will occur:
 - On the reset date you will begin a new ten year benefit waiting period.
 - On the reset date we will use the new GMIB value to calculate the 5% or 6% increase.

You may not apply the GMIB value to an Annuity Option until on or after the tenth Contract Anniversary following the most recent reset.

- If at the close of the NYSE on the Business Day just prior to the reset date your Contract Value is less than the GMIB value, the following will occur:
 - Your GMIB value will not be reset.
 - The current benefit waiting period will remain in place.

Reset Examples

Example 1

Assuming:

- You elect GMIB 5.
- A reset is scheduled for your Contract Anniversary.
- On the close of the Business Day just prior to your Contract Anniversary your Contract Value is \$120,000 and your GMIB value is \$110,250.

Then:

- Since your Contract Value is higher than your GMIB value we reset your GMIB value to equal \$120,000.
- Your benefit waiting period is extended to equal ten years from this Contract Anniversary.
- On this Contract Anniversary \$6,000 is the interest credited on your GMIB value for the Contract Year ($\$120,000 \times 5\%$ for GMIB 5 = \$6,000).
- During the Contract Year:
 - you may withdraw up to \$6,000 and we will make a dollar for dollar adjustment for withdrawals to your GMIB value;
 - for any withdrawal amount that exceeds \$6,000 during the Contract Year we will make a pro-rata adjustment for withdrawals to your GMIB value.

Example 2

Assuming:

- You elect GMIB 5.
- A reset is scheduled for your Contract Anniversary.
- On the close of the Business Day just prior to your Contract Anniversary your Contract Value is \$90,000 and your GMIB value is \$110,250.

Then:

- Since your Contract Value is less than your GMIB value we do not reset your GMIB value to equal your Contract Value. So your GMIB value remains at \$110,250.
- Your benefit waiting period is unchanged.
- On this Contract Anniversary \$5,513 is the interest credited on your GMIB value for the Contract Year ($\$110,250 \times 5\%$ for GMIB 5 = \$5,513).

- During the Contract Year:
 - you may withdraw up to \$5,513 and we will make a dollar for dollar adjustment for withdrawals to your GMIB value;
 - for any withdrawal amount that exceeds \$5,513 during the Contract Year we will make a pro-rata adjustment for withdrawals to your GMIB value.

For additional examples see “Appendix M – MassMutual Guaranteed Income Plus 5 Examples – 2008 Version.”

Eligibility for the GMIB Value

You can only apply the GMIB value to an Annuity Option on a Contract Anniversary. You will be eligible to apply all of the GMIB value to an Annuity Option or a minimum of \$10,000 of the GMIB value to an Annuity Option if:

- (1) you elected GMIB 5 or GMIB 6 at time of Contract issue and you do not cancel the feature;
- (2) you participated in an approved Asset Allocation Program at the time of Contract issue and until your Contract enters the Income Phase (see “Transfers and Transfer Programs – Asset Allocation Programs”);
- (3) your annuity starting date is on the tenth or a subsequent Contract Anniversary or, if your GMIB value was reset, your annuity starting date is on the tenth or a subsequent Contract Anniversary after the last reset (except as described under item 7);
- (4) the Annuitant is at least Age 60 (except as described under item 7);
- (5) the Annuitant is not older than Age 90 (for the 2008 Version) or not older than Age 85 (for the Pre-2008 Version); and
- (6) you elect an Annuity Option available for use with the GMIB value. Available options are as follows:
 - a) For the 2008 Version you may elect Fixed Annuity Payments. You may not elect a period certain only Annuity Option. You may apply all or a minimum of \$10,000 of the GMIB value to a lifetime Annuity Option or a lifetime Annuity Option with period certain within the following guidelines: If your lifetime Annuity Option includes a period certain, the period certain cannot be greater than 20 years if the Annuitant is Age 80 or under; ten years if the Annuitant is at or between Age 81 and 90; and for Contracts issued in New York: 15 years if the Annuitant is Age 65 or under; ten years if the Annuitant is at or between age 66 and 75; and five years if the Annuitant is at or between Age 76 and 90.
 - b) For the Pre-2008 Version, you may elect fixed and/or variable payments. You may apply all or a minimum of \$10,000 of the GMIB value to any of our available Annuity Options, however, if you elect an Annuity Option with a period certain only, it must be for a period certain of 20 or more years. For Qualified Contracts, your Annuity Options may be limited in order to comply with the Required Minimum Distribution rules that apply to Annuity Payments. Because any period certain cannot exceed your life expectancy under the Uniform Lifetime Table, you may not elect an Annuity Option with a period certain only beyond Age 80. In addition, to ensure that a the Contract will comply with the requirement minimum distribution requirements that apply upon your death, you may not elect a joint and survivor Annuity Option with a non-spouse joint Annuitant who is more than 10 years younger than you.

Additionally:

- (7)
 - a) For the 2008 Version, if your Contract Value is equal to zero, you will be eligible to apply all of the GMIB value to an Annuity Option if you meet the requirements of items 1, 2 and 6(a) and the Annuitant is Age 90 or younger. In some cases, your Contract Value and your GMIB value may both equal zero. In this case, there is no value to apply to an Annuity Option.
 - b) For the Pre-2008 Version, if your Contract Value is equal to zero, you will be eligible to apply all of the GMIB value to an Annuity Option if you meet the requirements of items 1, 2 and 6(b) and the Annuitant is Age 85 or younger. In some cases, your Contract Value and your GMIB value may both equal zero. In this case, there is no value to apply to an Annuity Option.

Should you be eligible and request to apply a portion of your GMIB value to an Annuity Option, on your Contract Anniversary we will reduce your GMIB value by the amount applied to the Annuity Option and then increase the remaining GMIB value by an annual interest rate of 5% for GMIB 5 or 6% for GMIB 6.

Fixed Annuity Payment Amounts and the GMIB

When you enter the Income Phase, we calculate Fixed Annuity Payments using the values which provide the most favorable Annuity Payment, either:

- the GMIB value and the fixed guaranteed payout rates in your Contract;
- your Contract Value and the fixed guaranteed payout rates in your Contract; or
- your Contract Value and our single premium immediate annuity rates available on the date we calculate your Annuity Payments.

Variable Annuity Payment Amounts and the GMIB

For the Pre-2008 Version you may elect fixed and/or variable Annuity Payments. For the 2008 Version you may not elect variable payments. We calculate the initial variable Annuity Payment using the values which provide the most favorable Annuity Payment, either:

- the GMIB value and the fixed guaranteed payout rates in your Contract; or
- your Contract Value and the variable guaranteed payout rates.

Future variable payments will depend on the performance of the Funds you select. If the actual performance on an annualized basis exceeds the 4% assumed investment rate plus the deductions for expenses, your Annuity Payments will increase. Similarly, if the actual rate is less than 4% annualized plus the amount of the deductions, your Annuity Payments will decrease.

Annuitant Age and Termination of GMIB 5 and GMIB 6

For the 2008 Version, you may apply your GMIB value to an Annuity Option until the Contract Anniversary following the Annuitant attaining Age 90. After that date, you may no longer apply the GMIB value to an Annuity Option and the GMIB feature is terminated. If you have not applied your GMIB value to an Annuity Option as of the Contract Anniversary following the Annuitant attaining Age 90, we will increase your Contract Value to equal 60% of the GMIB value if your Contract Value is less than 60% of the GMIB value on that date. If your Contract Value is greater than 60% of the GMIB value, we will make no adjustment.

For the Pre-2008 Version, you may apply your GMIB value to an Annuity Option until the Contract Anniversary following the Annuitant attaining Age 85. After that date, you may no longer apply the GMIB value to an Annuity Option and the GMIB feature is terminated.

Allocation Restrictions

If you elected GMIB 5 or GMIB 6, you must participate in an approved Asset Allocation Program. See "Transfers and Transfer Programs – Asset Allocation Programs."

If you elected GMIB 5 or GMIB 6, you cannot participate in the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, a DCA Fixed Account or the Automatic Rebalancing Program. Additionally, you cannot make allocations to The Fixed Accounts.

Additional Restrictions

You could only elect one GMIB feature. If you elect GMIB 5 or GMIB 6, you may not elect a Guaranteed Minimum Accumulation Benefit or MassMutual Lifetime Payment Plus.

Cost of GMIB 5 and GMIB 6

If you elect GMIB 5 or GMIB 6, we will deduct a charge from your Contract Value in the Funds. Effective December 15, 2020, the charge for the 2008 Version and Pre-2008 Version GMIB 5 and GMIB 6 is equal, on an annual basis, to 1.50% of the current GMIB value. The charge for each feature will never exceed 1.50%. We will deduct the charge for GMIB 5 or GMIB 6 quarterly in arrears while the feature remains in effect, commencing on the first quarter of your first Contract Year. Should you apply your full Contract Value to an Annuity Option, cancel this feature or fully surrender your Contract, the final charge for this feature will occur on the immediately preceding Contract Year quarter.

How to Elect GMIB 5 or GMIB 6

To have elected GMIB 5 or GMIB 6:

- the Annuitant must not have been older than Age 80 at time of Contract issue (for the 2008 Version) or the Annuitant must not have been older than Age 75 at time of Contract issue (for the Pre-2008 Version);
- you must have elected the feature at the time we issued your Contract;
- you must allocate 100% of your Purchase Payment to an approved Asset Allocation Program (see “Transfers and Transfer Programs – Asset Allocation Programs”).

Canceling GMIB 5 or GMIB 6

You can cancel GMIB 5 or GMIB 6. We will terminate your selection of GMIB 5 or GMIB 6 and the associated charge on the Business Day we receive our form in Good Order at our Service Center. Once the feature is terminated, it cannot be reinstated.

Withdrawal Benefit for Annuity Options for the Pre-2008 Version

If you elected GMIB 5 or GMIB 6 and later apply all or a portion of your GMIB value to generate annuity payments from an Annuity Option with a period certain, you may withdraw a portion or all of the commuted value of any remaining period certain payments.

If you elected an annuity option with variable payments, the following conditions apply. Partial withdrawals are limited to one per Contract Year and must be a minimum amount of \$5,000. The remaining Annuity Payments after a partial withdrawal must be at least \$100. Any request for a withdrawal will be taken proportionately from the Funds that you are invested in as of the date of the withdrawal. Once a withdrawal is made, the remaining period certain Annuity Payments will be reduced proportionally. Withdrawals will not affect Annuity Payments that are to be made after the period certain is over, if any.

Basic GMIB

If you elected the Guaranteed Minimum Income Benefit and you applied for your Contract prior to September 1, 2007 or in a state where GMIB 5 and GMIB 6 were not available when we issued your Contract, then your Guaranteed Minimum Income Benefit feature is the Basic GMIB. We no longer sell Contracts offering the Basic GMIB.

Current Charge: 0.60%

Maximum Charge: 1.25%

In the first Contract Year, the charge is a percentage of your Purchase Payments. On the last day of your first Contract Year and on the last day of each Contract Year thereafter, the annual charge is a percentage of your Contract Value on that date. We may increase the current charge at any time while you own the Contract, but it will never exceed the maximum charge. For additional detail on charge deduction see “Additional Benefits – Charges for Additional Features.”

What is the Basic GMIB?

The Basic GMIB is a feature you can elect when we issue your Contract. It sets a minimum floor for a future amount that you may apply to an Annuity Option. We call that amount the GMIB value.

How is the GMIB Value Calculated?

The GMIB value will equal:

- (1) your total Purchase Payments made to your Contract as of the end of your second Contract Year; where
- (2) on a daily basis each Purchase Payment is increased by a compounded annual rate of 5% starting from the date each is credited to your Contract Value until the maximum GMIB value is reached or you begin the Income Phase;
- (3) reduced by an adjustment for any withdrawals.

When the Annuitant reaches Age 80, the GMIB value will no longer increase.

The adjustment for withdrawals is calculated as follows:

- (1) the withdrawal amount, including any applicable charges;
- (2) divided by your Contract Value immediately prior to the withdrawal; with the result
- (3) multiplied by the most recently calculated GMIB value.

The GMIB value may be reduced by more than the actual dollar amount of the withdrawal.

The Contract rider describing this Basic GMIB refers to the GMIB value as the Guaranteed Annuitization Value or the Guaranteed Minimum Income Benefit.

The maximum GMIB value is 200% of the Purchase Payments made to your Contract Value in the first two Contract Years, adjusted for withdrawals. The GMIB value will never be greater than the maximum GMIB value.

We consider requests to apply part of your Contract Value to an Annuity Option as a withdrawal for purposes of calculating the GMIB value.

Eligibility for the GMIB Value

You will be eligible to apply all or a portion of the GMIB value to an Annuity Option if:

- you elected the Basic GMIB at time of Contract issue and you do not cancel the feature;
- you participated in an approved Asset Allocation Program at the time of Contract issue and until your Contract enters the Income Phase (see “Transfers and Transfer Programs – Asset Allocation Programs”);
- your Contract is beyond its seventh Contract Year (we measure a Contract Year from the anniversary of the day we issued your Contract);
- the Annuitant reaches Age 60; and
- you elect to receive Fixed Annuity Payments through a life contingent Annuity Option (currently Annuity Options A, B, C and D). For Qualified Contracts, in order to ensure that the Contract will comply with the required minimum distribution requirements that apply upon your death, you may not elect a joint and survivor Annuity Option with a non-spouse joint Annuitant who is more than 10 years younger than you.

Allocation Restrictions

If you elected the Basic GMIB, you must participate in an approved Asset Allocation Program. See “Transfers and Transfer Programs – Asset Allocation Programs.”

If you elected the Basic GMIB, you cannot participate in the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, a DCA Fixed Account or the Automatic Rebalancing Program. Additionally, you cannot make allocations to The Fixed Accounts.

Additional Restrictions

If you elected the Basic GMIB, you may not elect a Guaranteed Minimum Accumulation Benefit or MassMutual Lifetime Payment Plus.

Cost of the Basic GMIB

If you elected the Basic GMIB, we will deduct an additional charge of 0.60% of Contract Value on an annual basis while the feature is in effect. We may increase this charge at any time while you own the Contract, but the charge will never exceed 1.25% of Contract Value on an annual basis. We will no longer make this deduction once you apply your full Contract Value to an Annuity Option or cancel the Basic GMIB. If you elect to discontinue the Basic GMIB and its associated benefit, the charge will be discontinued when

we receive your request in Good Order, and we will apply a proportionate credit of the remaining prepaid charge to your Contract Value.

How to Elect the Basic GMIB

To have elected the Basic GMIB:

- the Annuitant must have been under age 80 at time of Contract issue;
- you must have elected the feature at the time we issued your Contract;
- you must allocate 100% of your Purchase Payment to an approved Asset Allocation Program (see “Transfers and Transfer Programs – Asset Allocation Programs”).

Canceling the Basic GMIB

We will terminate your selection of this feature on the Business Day we receive our form in Good Order at our Service Center. We will apply a proportionate credit of the remaining prepaid charge to your Contract Value. Once the Basic GMIB is terminated, it cannot be reinstated.

Annuity Payments and the GMIB

When you enter the Income Phase, we calculate your Annuity Payments using the values which provide the most favorable Annuity Payment, either:

- the GMIB value and the guaranteed payout rates in your Contract;
- your Contract Value and the guaranteed payout rates in your Contract; or
- your Contract Value and our single premium immediate annuity rates available on the date we calculate your Annuity Payments.

MassMutual Lifetime Income ProtectorSM

Available to Contracts issued on or after 1/11/2010, subject to state availability. Certain aspects of this feature may vary by state.

See sub-section “Cost of MassMutual Lifetime Income Protector” for detail about charges for this feature.

Changes to an Owner (or an Annuitant, if the Owner is a non-natural person) may terminate MassMutual Lifetime Income Protector. Changes to the Beneficiary may reduce the value of the benefit.

Excess withdrawals will reduce and may eliminate the value of the guarantees provided by this feature. See “Appendix N – MassMutual Lifetime Income Protector Examples – Example 5.”

What is MassMutual Lifetime Income Protector?

MassMutual Lifetime Income Protector is an optional feature you can add to your Contract for an additional charge. MassMutual Lifetime Income Protector provides that even if your Contract Value is reduced to zero, you will receive a guaranteed minimum level of income for the life of the “covered person(s),” generally you or you and your spouse. Lifetime income is distributed through annual withdrawals from your Contract Value. If your Contract Value is reduced to zero, then lifetime income is distributed through settlement payments, provided the terms and conditions of the feature are met.

MassMutual Lifetime Income Protector may not be appropriate for you if you are interested in maximizing the Contract’s potential for long-term accumulation and tax deferral rather than taking current withdrawals and ensuring a stream of income for life.

Election at Contract Issue

To have elected MassMutual Lifetime Income Protector at the time we issued your Contract:

- your initial Purchase Payment must have been \$25,000 or greater;
- the younger covered person must have been under Age 76;
- your Contract must have been issued in a state where we offered MassMutual Lifetime Income Protector; and
- you must have allocated your Purchase Payment to an approved Asset Allocation Program (see “Transfers and Transfer Programs – Asset Allocation Programs”).

If you elect MassMutual Lifetime Income Protector, you cannot elect the Annual Ratchet Death Benefit or a Guaranteed Minimum Accumulation Benefit.

Participation in the SWP is allowed only when you commence withdrawals of the annual income amount on or after the income eligibility date. See “Withdrawals of the Annual Income Amount” later in this section for additional information.

Election After Contract Issue

If we issued your Contract after September 14, 2009 and MassMutual Lifetime Income Protector was not available to elect on your application, then you were eligible to make your election after we issued your Contract, subject to the following:

- (1) your Contract Value was \$25,000 or greater on the date we received your election request in Good Order;
- (2) the younger covered person must have been under Age 76 on the date we received your election request in Good Order at our Service Center; and
- (3) we must have received your election request on our form in Good Order at our Service Center within 60 calendar days after the date we began offering MassMutual Lifetime Income Protector in the state where your Contract was issued.

If you meet all the requirements for election after Contract issue, but we did not issue your Contract within 60 days of the feature becoming available solely because we were waiting for additional funds relating to an IRC Section 1035 exchange or qualified transfer, then we amend (3) to read as follows: we must have received your election request on our form at our Service Center within 60 calendar days after the date we issued your Contract.

We reserve the right to modify or terminate this program at any time without notice.

You cannot elect MassMutual Lifetime Income Protector if your Contract has:

- a current election of the Annual Ratchet Death Benefit;
- a current election of a Guaranteed Minimum Accumulation Benefit; or
- Contract Value in a fixed account.

When you elect MassMutual Lifetime Income Protector we will cancel any transfer programs you currently participate in and require you to transfer your Contract Value into an approved Asset Allocation Program. If you are participating in the SWP when you elect this feature, we will cancel the SWP because early withdrawals have a negative impact on the feature.

Covered Person(s)

If you have the single life version, one covered person will be named. If you have the joint life version, two covered persons will be named. The younger covered person must be under Age 76 when MassMutual Lifetime Income Protector is elected. The covered person(s) is significant because:

- the life of the covered person(s) is used to determine the amount and duration of lifetime income; and
 - the income eligibility date is based in part on the younger covered person’s age.
-

Single Life Version and Covered Person Requirements

The single life version can be elected only if your Contract is a Non-Qualified Contract, non-qualified deferred compensation Contract (non-457) or an Individual Retirement Annuity, including traditional, SEP, SIMPLE, Roth or Custodial IRA.

- If your Contract is individually owned, the covered person must be the Owner.
- If the Owner is a non-natural person, the covered person must be the Annuitant.
- If there are Joint Owners, they must be spouses and the only primary beneficiaries. The covered person is the first named Owner on the application.

Joint Life Version and Covered Person Requirements

The joint life version can be elected only if your Contract is a Non-Qualified Contract or an Individual Retirement Annuity, including traditional, SEP, SIMPLE or Roth, excluding Custodial IRAs. If the Contract is sold as a Non-Qualified Contract with a trust Ownership, the trust must be a grantor trust.

- If your Contract is individually owned, the covered person must be the Owner. The second covered person must be the spouse of the Owner and sole primary Beneficiary.
- If the Owner is a non-natural person, the covered person must be the Annuitant. The second covered person must be the spouse of the Annuitant and the sole primary Beneficiary.
- If there are Joint Owners, the covered persons must be spouses, and the only primary beneficiaries.

Change from Joint Life to Single Life

We only allow a change from the joint life version to the single life version if:

- the change is due to the death of a covered person or a change in marital status of a covered person due to a divorce;
- the change is made prior to the income start date; and
- we receive notification in Good Order at our Service Center before the income start date.

When we change the joint life version to the single life version we base the income percentage on the remaining covered person's age as of the income start date using the single life income percentages. The income eligibility date will be based on the remaining covered person's age.

We do not allow a change from the single life version to the joint life version.

Important Terms

Income Eligibility Date

On and after the income eligibility date you can elect to commence withdrawals of the annual income amount. The income eligibility date is the later of:

- the Contract Anniversary when the younger covered person is Age 60; or
- your fifth Contract Anniversary following the date we add MassMutual Lifetime Income Protector to your Contract.

Income Start Date

The income start date is the date of the first withdrawal on or after the income eligibility date. It is also the date we require you to elect the SWP and commence automated withdrawals of the annual income amount.

Annual Income Amount

We calculate the annual income amount on the income eligibility date and on each subsequent Contract Anniversary. The annual income amount equals the applicable income percentage multiplied by your Contract Value on your most recent Contract Anniversary.

Withdrawals of the annual income amount are not subject to any Contingent Deferred Sales Charge. *The annual income amount will vary each Contract Year, but it will never be less than the guaranteed income floor.*

Guaranteed Income Floor

The guaranteed income floor is the minimum annual income amount available each Contract Year on or after the income eligibility date. In addition, the guaranteed income floor is the amount that will be distributed if your Contract moves to the settlement phase.

We calculate the guaranteed income floor on the income eligibility date, on each subsequent Contract Anniversary prior to the settlement phase, and after any excess withdrawal. We calculate the guaranteed income floor by multiplying the applicable income percentage by the income base. Once your Contract enters the settlement phase the guaranteed income floor no longer changes.

Income Base

We use the income base to calculate the guaranteed income floor. The income base is not available to withdraw. The income base can never exceed \$5,000,000.

The income base is equal to:

- (1) your Contract Value on the date we add MassMutual Lifetime Income Protector to your Contract;
- (2) plus any additional Purchase Payments received after the date we add the feature to your Contract, but prior to your second Contract Anniversary;
- (3) adjusted for excess withdrawals. We explain the adjustment for excess withdrawals under “Additional Benefits – MassMutual Lifetime Income Protector – Excess Withdrawals and the Income Base.”

Income Percentage

The initial income percentage is based on the younger covered person’s age on the income start date. On any subsequent Contract Anniversary the income percentage will be increased if on that Contract Anniversary:

- your Contract Value (less any Purchase Payments made more than two years after your Issue Date) is greater than the income base; and
- the income percentage based on the age of the younger covered person is greater than your current income percentage. On any Contract Anniversary following the death of the younger covered person we will use the age of the surviving covered person.

The income percentage will never decline.

Single Life Version		Joint Life Version	
Age	Income Percentage	Age	Income Percentage
60–64	4.0%	60–64	3.5%
65–69	4.5%	65–69	4.0%
70–74	5.0%	70–74	4.5%
75–79	5.5%	75–79	5.0%
80–84	6.0%	80–84	5.5%
85 and over	6.5%	85 and over	6.0%

Excess Withdrawals

Excess withdrawals are defined as:

- any withdrawal prior to the income eligibility date including:
 - amounts withdrawn under Internal Revenue Code Required Minimum Distribution (RMD) rules; and
 - amounts withdrawn in accordance with the Contract's free withdrawal provision described in "Expenses – Free Withdrawals;" and
- the portion of any withdrawal on or after the income eligibility date that causes the total withdrawn in a Contract Year to exceed the current annual income amount. This includes any amount withdrawn in accordance with the Contract's free withdrawal provision that exceeds the current annual income amount.

Exception for RMDs

Any withdrawal taken on or after the income eligibility date to satisfy RMD rules which is in excess of the annual income amount will not be treated as an excess withdrawal provided the following conditions are met:

- it must be taken as part of our RMD program;
- the RMD amount must be calculated using only the assets held under the Contract;
- the RMD must be for the current calendar year; and
- in any one Contract Year, RMD withdrawals for only a single calendar year can be taken.

We will not contact you before processing your request for an excess withdrawal.

How MassMutual Lifetime Income Protector Works

Once you elect MassMutual Lifetime Income Protector you can make two types of withdrawals from your Contract Value:

- Withdrawals of the annual income amount. These withdrawals cannot begin before the income eligibility date. Once begun, these withdrawals continue until your Contract Value reduces to zero. If at that time the settlement phase begins, we will provide annual settlement payments until death of the last surviving covered person. See "Additional Benefits – MassMutual Lifetime Income Protector – Settlement Phase."
- Excess withdrawals. **Excess withdrawals may be taken at any time. They will reduce, and may eliminate, the value of the guarantees provided by this feature.**

Your withdrawals are taken from your Contract Value unless your Contract enters the settlement phase, in which case we use our own assets to make settlement payments to you. See "Additional Benefits – MassMutual Lifetime Income Protector – Settlement Phase."

Examples

For examples of how the feature works see "Appendix N – MassMutual Lifetime Income Protector Examples."

Withdrawals of the Annual Income Amount

You can commence withdrawals of the annual income amount on or after the income eligibility date. Withdrawals of the annual income amount must be automated through the SWP. You cannot stop the SWP of the annual income amount once it begins, unless you enroll in the MassMutual RMD program in order to satisfy Required Minimum Distribution rules. Withdrawals of the annual income amount are taken from your Contract Value. If enrolled in the RMD program, you will receive the greater of your annual income amount or your RMD amount in each Contract Year without it being considered an excess withdrawal.

The SWP is not available prior to the income eligibility date. On or after the income eligibility date, the SWP is available only for withdrawals of the annual income amount.

Negative Impact of Excess Withdrawals

In addition to reducing your Contract Value, each excess withdrawal immediately reduces the income base and the guaranteed income floor.

All excess withdrawals are subject to any applicable Contingent Deferred Sales Charge.

Excess Withdrawals and the Income Base

An excess withdrawal reduces the income base in direct proportion to the Contract Value reduction for the amount of the excess withdrawal.

The following formula shows the impact of an excess withdrawal on the income base.

$$A = B \times (C/D)$$

Where:

- A is the income base after the excess withdrawal;
- B is the income base immediately prior to the excess withdrawal;
- C is your Contract Value immediately after the excess withdrawal; and
- D is your Contract Value immediately prior to the excess withdrawal.

If only a portion of a withdrawal is an excess withdrawal, we will first reduce your Contract Value by the non-excess withdrawal portion and your income base will remain the same. We will then reduce your Contract Value by the excess withdrawal portion and adjust the income base using the formula above.

Impact of a Request to Apply All or a Portion of Your Contract Value to an Annuity Option

We consider a request to apply all or a portion of your Contract Value to an Annuity Option as a withdrawal for the purposes of calculation of the income base, guaranteed income floor and annual income amount.

Impact of Withdrawals on the Death Benefit

If you are participating in MassMutual Lifetime Income Protector and the Basic Death Benefit, when you make withdrawals we will reduce the value of the death benefit as described in "Death Benefit – Basic Death Benefit – (Version 9/1/07)." Any withdrawal will lower your Contract Value. Therefore, if you are participating in the Contract Value Death Benefit any withdrawal will reduce the death benefit. See "Additional Benefits – Contract Value Death Benefit."

Withdrawals Before the Income Eligibility Date

Any withdrawal, including RMDs, taken prior to the income eligibility date is an excess withdrawal. Such withdrawal:

- is subject to any applicable Contingent Deferred Sales Charge;
 - reduces your Contract Value;
 - reduces the income base;
 - reduces the guaranteed income floor;
 - reduces any future annual settlement payments; and
 - reduces the death benefit.
-

Withdrawals On or After the Income Eligibility Date

Requesting the First Withdrawal

The date of your first withdrawal is the income start date. At the time of your first withdrawal we require you to elect the SWP even if you do not want to utilize it for the first withdrawal. You cannot stop the SWP of the annual income amount once it begins, unless you enroll in the RMD program.

SWP and the Annual Income Amount

When you elect the SWP you will establish a withdrawal frequency (monthly, quarterly, semi-annually or annually) for the annual income amount. If the withdrawals are RMDs as part of the RMD program, the withdrawal frequency will be annual on each December 15. If the annual income amount is taken as part of the RMD program, you will receive the greater of the annual income amount for the Contract Year or the RMD amount for the calendar year.

We apportion the annual income amount for the frequency you elect. For example, if you elect an annual frequency, the first SWP withdrawal will be 100% of the annual income amount; if you elect a monthly frequency, the first SWP withdrawal will be 1/12 of the annual income amount.

If the income start date is not on your Contract Anniversary, we will prorate the number of SWP withdrawals based on the scheduled frequency elected. For example: a) you request a monthly frequency; b) the annual income amount is \$12,000; c) the income start date occurs on the sixth month of a Contract Year. Therefore, in that Contract Year there will be seven monthly withdrawals of \$1,000. We will not require that you withdraw the remaining \$5,000 of the annual income amount, but you may take a withdrawal outside of the SWP. In each subsequent Contract Year we will require that you withdraw the entire annual income amount.

If you choose to have both a SWP and the RMD program run at the same time, you will receive your annual income amount as elected for the SWP, but each December 15, the RMD program will run and will pay the amount remaining to satisfy RMD for that calendar year. If there is any annual income amount remaining, the scheduled SWP will continue to run until it is depleted. If the entire annual income amount is withdrawn prior to the next Contract Anniversary, we will halt the SWP for the remainder of the current Contract Year. Any subsequent withdrawals prior to the next Contract Anniversary will be treated as an excess withdrawal.

Withdrawals Outside of the SWP

If you make withdrawals outside of the SWP, we will count those towards the annual income amount. If the entire annual income amount is withdrawn prior to the next Contract Anniversary, we will halt the SWP for the remainder of the current Contract Year. Any subsequent withdrawals prior to the next Contract Anniversary will be treated as excess withdrawals, unless taken as part of the RMD program. Upon the next Contract Anniversary we will recalculate the annual income amount and the SWP will commence, based on the frequency previously established.

Any portion of a withdrawal that exceeds the annual income amount will be considered an excess withdrawal, unless enrolled in the RMD program, which allows you to withdraw the greater of the annual income amount or Required Minimum Distribution amount. The specific criteria that the Required Minimum Distribution must meet are described in "Additional Benefits – MassMutual Lifetime Income Protector – Important Terms – Excess Withdrawals."

Settlement Phase

Your Contract will enter the settlement phase if:

- your Contract Value is reduced to zero; and
- the guaranteed income floor is greater than zero.

When your Contract enters the settlement phase:

- the remaining annual income amount for that Contract Year is paid in accordance with the frequency previously selected;
- beginning on the next Contract Anniversary settlement payments will be paid each Contract Year until the last surviving covered person dies. However, if the Owner of a Qualified Contract dies and there is a surviving covered person who is not an "Eligible Designated Beneficiary" as defined in IRC Section 401(a)(9), settlement payments may only continue through the end of the calendar year that contains the tenth anniversary of death;
- all other rights and benefits under your Contract, including any applicable death benefit, will terminate and additional Purchase Payments will not be accepted; and
- we will no longer deduct the charge for MassMutual Lifetime Income Protector.

Amount of Settlement Payments

The annual amount of settlement payments will equal the guaranteed income floor amount calculated on the date the Contract enters the settlement phase. If you are receiving settlement payments, we will treat your Contract as though you had annuitized and we will report settlement payments as Annuity Payments for tax reporting purposes.

Frequency of Settlement Payments

You can request settlement payments be paid monthly, quarterly, semi-annually or annually. If any payment is less than \$100, we reserve the right to change the payment basis to equivalent quarterly, semi-annual or annual payments or to provide an equivalent cash lump sum.

Latest Permitted Annuity Starting Date

The latest permitted annuity starting date is defined in "The Income Phase – Annuity Payment Start Date." If you still have Contract Value during the Accumulation Phase, once the latest permitted annuity starting date is reached you must elect one of the following:

- Apply your Contract Value to one of the Annuity Options described in "The Income Phase – Annuity Options."
- Apply your Contract Value to receive payments for the life of the covered person(s). These payments will be the greater of the guaranteed income floor or the annual amount that the Contract Value will provide under:
 - a life fixed annuity for the single life version; or
 - a joint and last survivor fixed annuity for the joint life version.
- Terminate your Contract by taking a full withdrawal of your Contract Value.

Payment of the Contract's Death Benefit and MassMutual Lifetime Income Protector

If you have a current election of MassMutual Lifetime Income Protector and a death benefit is paid from the Contract, there will be one of several outcomes:

- If the Beneficiary takes the death benefit in a lump sum under the terms of the Contract, the Contract will terminate and MassMutual Lifetime Income Protector will no longer be in effect.
- If the Beneficiary does not take the death benefit in a lump sum, then:
 - If the deceased Owner (or the Annuitant, if the Owner is a non-natural person) is the last surviving covered person, MassMutual Lifetime Income Protector will no longer be in effect. If the Beneficiary is the covered person's spouse, he or she may continue the Contract without MassMutual Lifetime Income Protector.
 - If the deceased Owner (or the Annuitant, if the Owner is a non-natural person) is not the last surviving covered person, MassMutual Lifetime Income Protector will continue provided the covered person is eligible to and elects to continue the Contract as their own.

The right to continue the Contract by a surviving spouse, a domestic partner, or a civil union partner can only be exercised once while the Contract is in effect.

Allocation Restrictions

If you elect MassMutual Lifetime Income Protector, you must participate in an approved Asset Allocation Program. See "Transfers and Transfer Programs – Asset Allocation Programs." You cannot participate in the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, a DCA Fixed Account or the Automatic Rebalancing Program. Additionally, you cannot make allocations to The Fixed Accounts.

Additional Purchase Payment Limits

We reserve the right to limit additional Purchase Payments made after the first Contract Year to a total of \$100,000.

Cost of MassMutual Lifetime Income Protector

If you elect MassMutual Lifetime Income Protector, we will deduct a charge from your Contract Value. The charge is equal, on an annual basis, to a percentage of the income base as of the date the charge is deducted. Currently, the charge is 0.95% of current income base. We may increase this charge at any time while you own the Contract, but the charge will never exceed 1.95% of current income base. While the feature is in effect we will deduct the charge quarterly in arrears. The charge will commence on the first Contract Year quarter following the date we add MassMutual Lifetime Income Protector to your Contract. This charge will end on the earlier of the date your Contract enters the settlement phase or the date MassMutual Lifetime Income Protector is terminated.

Termination of MassMutual Lifetime Income Protector

You cannot cancel this feature; however, it will terminate upon the earliest of the following dates:

- when your full Contract Value is applied to an Annuity Option unless there are payments remaining under this feature;
- when an excess withdrawal reduces your Contract Value to zero;
- when you request we cancel the Contract;
- when the Contract is assigned;
- when the Owner is changed, if the Contract is individually owned;
- when the Annuitant is changed, if the Owner is a non-natural person;

- when there is no longer a surviving covered person;
- when a death benefit is payable and the Beneficiary takes the death benefit as a lump sum under the terms of the Contract;
- when a surviving covered person does not continue the Contract upon death of an Owner.

Once terminated the feature cannot be re-elected.

Important Considerations

Once you elect MassMutual Lifetime Income Protector you cannot cancel the feature.

You cannot stop the Systematic Withdrawal Program of the annual income amount once it begins.

You should not elect MassMutual Lifetime Income Protector if you have a need to take withdrawals, including RMDs, before the income eligibility date, because early withdrawals have a negative impact on the feature. After the income eligibility date, excess withdrawals will reduce and may eliminate the value of the guarantees provided by MassMutual Lifetime Income Protector. Excess withdrawals include RMDs that exceed the annual income amount and do not meet specific criteria. See “Additional Benefits – MassMutual Lifetime Income Protector – Important Terms – Excess Withdrawals.”

The free withdrawal provision described in “Expenses – Free Withdrawals” is available without an additional charge. It allows you to annually withdraw a percentage of your Contract Value without incurring a Contingent Deferred Sales Charge. Before electing MassMutual Lifetime Income Protector compare its benefits to those of the free withdrawal provision to determine if MassMutual Lifetime Income Protector is in your best interest.

Changes to an Owner (or an Annuitant, if the Owner is a non-natural person) may terminate MassMutual Lifetime Income Protector.

Domestic partners and civil union partners are not recognized as spouses for purposes of federal tax law. Therefore, when the Contract is continued by a domestic partner or civil union partner, adverse tax consequences may result from both continuing the Contract and continuing MassMutual Lifetime Income Protector.

If you elect MassMutual Lifetime Income Protector, we limit the investment choices available to you for the life of the Contract.

The restriction in the amount and type of investment choices that are available to you under MassMutual Lifetime Income Protector is intended to help us manage the risk that we will be required to make payments to you under the MassMutual Lifetime Income Protector.

Excess withdrawals will reduce and may eliminate the value of the guarantees provided by this feature.

Additional Purchase Payments after the second Contract Year will not increase the value of the guarantees provided by this feature.

Election of this feature does not in any way guarantee performance of any of the investment choices available under the Contract.

Before electing MassMutual Lifetime Income Protector consult with a qualified financial professional to discuss this feature and all other aspects of the Contract.

MassMutual Lifetime Payment PlusSM

MassMutual Lifetime Payment Plus was available if you applied for your Contract on or after January 19, 2008 and prior to March 31, 2009.

See sub-section “Cost of MassMutual Lifetime Payment Plus” for detail about charges for this feature.

Changes to an Owner (or an Annuitant, if the Owner is a non-natural person) may terminate MassMutual Lifetime Payment Plus. Changes to the Beneficiary may reduce the value of the benefit.

What is MassMutual Lifetime Payment Plus?

MassMutual Lifetime Payment Plus is designed as a guaranteed minimum lifetime withdrawal benefit. If you elect MassMutual Lifetime Payment Plus, we will permit you to receive a specified withdrawal amount annually for life, even if your Contract Value is zero and subject to the terms and conditions described in this section. There are two versions of this feature: Single Life and Joint Life.

Examples

For examples of how the benefit may work see “Appendix O – MassMutual Lifetime Payment Plus Examples.”

How to Elect MassMutual Lifetime Payment Plus

To have elected MassMutual Lifetime Payment Plus, you must:

- have elected MassMutual Lifetime Payment Plus at time of Contract issue*;
- participate in an Asset Allocation Program (see “Transfers and Transfer Programs – Asset Allocation Programs”); and
- have designated the covered person(s).

**See “Payment of the Contract’s Death Benefit and MassMutual Lifetime Payment Plus” in this section for rules regarding a spouse’s right to re-elect this feature upon death of the Owner.*

Canceling MassMutual Lifetime Payment Plus

You can cancel MassMutual Lifetime Payment Plus. We will terminate your election of this feature on the Business Day we receive our form in Good Order at our Service Center. The final charge for this feature will occur on the Contract Year quarter immediately preceding termination. Once the feature is terminated, it cannot be reinstated.

Covered Person(s)

The covered person is generally you, the Owner. You will designate the covered person(s) when you complete your application for the Contract. You will designate one covered person if you elect the Single Life version of MassMutual Lifetime Payment Plus and two covered persons if you elect the Joint Life version. The younger covered person must be under Age 81 at the time we issue your Contract. Once we issue the Contract, you cannot change the designated covered person(s).

The covered persons are significant because:

- we offer a guaranteed lifetime withdrawal amount for the life of the covered persons, subject to the terms and conditions described in this section; and
- on the later of your Issue Date or when the younger covered person attains Age 60, the benefit base which we use to determine your guaranteed lifetime withdrawal amount will no longer be reduced by withdrawals unless you withdraw more than the guaranteed lifetime withdrawal amount during a Contract Year.

For purposes of determining benefits under this feature, we will always use the younger covered person’s Age, even if the older covered person becomes the only surviving covered person.

You will designate the covered person based on the restrictions noted here:

MassMutual Lifetime Payment Plus – Single Life

- If you elect single life, you will designate one covered person.
- If an individually owned Contract, the covered person must be the Owner.
- If the Owner is a non-natural person, the covered person must be the Annuitant.
- If there are joint Owners, the covered person is the Owner you designate as the covered person when you complete your application for the Contract.
- If there are joint Owners, they must be spouses and the only primary beneficiaries.

MassMutual Lifetime Payment Plus – Joint Life

If you elect joint life, you will designate two covered persons.

A joint life option can only be elected if your Contract is a Non-Qualified Contract or an Individual Retirement Annuity, including a traditional, SEP, Simple, or Roth, excluding Custodial IRAs.

- If an individually owned Contract, the covered person must be the Owner. The second covered person must be the spouse of the Owner and the sole primary Beneficiary.
- If the Owner is a non-natural person, the covered person must be the Annuitant. The second covered person must be the spouse of the Annuitant and the sole primary Beneficiary.
- If there are joint Owners, the covered persons must be spouses, joint Owners and the only primary beneficiaries.

Some of the benefits of this feature may be unrealized if you elect joint life and there is a subsequent divorce between the covered persons.

The Benefit Base: What We Use to Determine the Guaranteed Withdrawal Amounts

The MassMutual Lifetime Payment Plus benefit base is one of the variables we use when determining how much is available for you to withdraw each Contract Year. The initial benefit base is your Contract Value on the date we issue your Contract.

The benefit base may increase as a result of:

- additional Purchase Payments;
- credits;
- an annual ratchet; or
- an enhancement to the benefit base.

The benefit base may decrease as a result of withdrawals. The benefit base cannot be withdrawn in a lump sum.

The Maximum Benefit Base

The benefit base will never exceed the maximum benefit base we allow which is \$5,000,000.

The Guaranteed Lifetime Withdrawal Date

The Guaranteed Lifetime Withdrawal Date is the later of your Issue Date or the date the younger covered person attains Age 60. This is the date on which we guarantee the benefit base for life.

On or After the Guaranteed Lifetime Withdrawal Date

The Guaranteed Lifetime Withdrawal Amount

On or after the Guaranteed Lifetime Withdrawal Date, the Guaranteed Lifetime Withdrawal Amount is the annual amount, up to a maximum withdrawal equal to 5% of the benefit base, we guarantee is available for withdrawals each Contract Year during the life of the covered person(s). After the Guaranteed Lifetime Withdrawal Date, each time the benefit base is changed the Guaranteed Lifetime Withdrawal Amount will equal 5% of the new benefit base.

Impact of Withdrawals on the Benefit Base

Beginning on the Guaranteed Lifetime Withdrawal Date, the benefit base will not reduce if total withdrawals during a Contract Year are less than or equal to the Guaranteed Lifetime Withdrawal Amount.

If a withdrawal causes total withdrawals during a Contract Year to exceed the Guaranteed Lifetime Withdrawal Amount, or if total withdrawals during a Contract Year already exceeded the Guaranteed Lifetime Withdrawal Amount, then the benefit base will equal the lesser of:

- your Contract Value immediately after the withdrawal; or
- the benefit base immediately prior to the withdrawal, minus the amount of the excess withdrawal.

As of your next Contract Anniversary, the Guaranteed Lifetime Withdrawal Amount will then equal 5% of the new benefit base.

However, the benefit base will not be reduced if all withdrawals during the Contract Year are for required minimum distributions we calculate under an automatic distribution program, even if such distributions exceed the Guaranteed Lifetime Withdrawal Amount available in a Contract Year. We define required minimum distributions as any distribution that we must distribute to you or a plan participant pursuant to IRC Sections 401(a)(9), 403(b)(10), 408(b)(3) or 408A(c). Required Minimum Distributions are generally required to begin by the required beginning date specified in IRC Section 401(a)(9).

Before the Guaranteed Lifetime Withdrawal Date

The Guaranteed Withdrawal Amount

The only time we issue a Contract before the Guaranteed Lifetime Withdrawal Date is if we issue a Contract before the youngest covered person has attained Age 60. Prior to the Guaranteed Lifetime Withdrawal Date, the Guaranteed Withdrawal Amount is the annual amount up to a maximum percentage that we guarantee is available for withdrawals each Contract Year prior to the Guaranteed Lifetime Withdrawal Date. On the date we issue your Contract, the Guaranteed Withdrawal Amount is equal to 5% of your initial Purchase Payment to the Contract.

After your Issue Date and before the Guaranteed Lifetime Withdrawal Date, the Guaranteed Withdrawal Amount can increase if an annual ratchet, credit or Purchase Payment would result in a higher Guaranteed Withdrawal Amount than the current Guaranteed Withdrawal Amount. The Guaranteed Withdrawal Amount will decrease only if you make a withdrawal in excess of the Guaranteed Withdrawal Amount or the benefit base reduces to zero.

Impact of Withdrawals on the Benefit Base

Prior to the Guaranteed Lifetime Withdrawal Date, any withdrawal reduces the benefit base. If the withdrawal is less than or equal to the Guaranteed Withdrawal Amount, the withdrawal will reduce the benefit base on a dollar-for-dollar basis. If the withdrawal is greater than the Guaranteed Withdrawal Amount, the benefit base will equal the lesser of:

- your Contract Value immediately after the withdrawal; or
- the benefit base immediately prior to the withdrawal, minus the amount of the withdrawal.

Additional Purchase Payments and the Benefit Base

Each time an additional Purchase Payment is received prior to the Guaranteed Lifetime Withdrawal Date, the benefit base will increase by the amount of that additional Purchase Payment.

After the Guaranteed Lifetime Withdrawal Date, an increase to the benefit base due to an additional Purchase Payment is determined as follows:

- If there have been no additional Purchase Payments or annual ratchets since the Guaranteed Lifetime Withdrawal Date, then all withdrawals since the Guaranteed Lifetime Withdrawal Date will be deducted from the additional Purchase Payment. Any additional Purchase Payment amount remaining after that deduction will be added to the benefit base.

- If, since the Guaranteed Lifetime Withdrawal Date, the benefit base has been adjusted due to additional Purchase Payments or annual ratchets, then the cumulative Purchase Payments since the last adjustment will be reduced by withdrawals. The withdrawals and additional Purchase Payments that have not adjusted the benefit base are determined beginning with the later of:
 - an increase in benefit base by an additional Purchase Payment; or
 - an annual ratchet.

Any amount of the current additional Purchase Payment remaining after the reduction will be added to the benefit base.

We reserve the right to limit additional Purchase Payments when you have an election of MassMutual Lifetime Payment Plus. We may waive any such additional Purchase Payment limit in a uniform and nondiscriminatory manner upon prior Written Notice.

Any Purchase Payments received on or after the younger covered person attains age 81 will not increase the benefit base.

Credits to the Benefit Base

Each year during the first ten Contract Years, if no withdrawals are taken during a particular Contract Year, then the benefit base will increase on the following Contract Anniversary.

If the benefit base has never been recalculated due to an annual ratchet or withdrawal, we will increase the benefit base by an amount equal to 6% of the sum of: your original benefit base value plus any Purchase Payments applied to the benefit base after we issued your Contract.

If the benefit base was previously recalculated due to an annual ratchet or a withdrawal, then the benefit base will increase each year a withdrawal has not been taken by an amount equal to 6% of the sum of: the benefit base as of the last benefit base recalculation plus any Purchase Payments applied to the benefit base after such recalculation.

See "Additional Purchase Payments and the Benefit Base" for how we calculate the increase by Purchase Payments and "Before the Guaranteed Lifetime Withdrawal Date – Impact of Withdrawals on the Benefit Base" for how we calculate the decrease for withdrawals.

Annual Ratchet and the Benefit Base

Before the younger covered person attains Age 91, on each Contract Anniversary we will compare your Contract Value to your benefit base. If your Contract Value is greater than your benefit base, we will automatically ratchet up the benefit base to equal your Contract Value. During your first ten Contract Years, we will apply any credit to the benefit base before we make this comparison (see "Credits to the Benefit Base"). You may opt out of any annual ratchet by submitting a Written Request in Good Order to our Service Center within 30 calendar days prior to your Contract Anniversary.

Enhanced Benefit Base and Enhanced Benefit Base Date

The benefit base will be enhanced to equal the greater of the benefit base or the enhanced benefit base amount if no withdrawals are taken prior to the enhanced benefit base date, which is the later of:

- ten years from your Issue Date; or
- when the younger covered person reaches Age 70.

The enhanced benefit base amount equals:

- (1) 2 multiplied by any Purchase Payments applied to the benefit base during the first Contract Year; plus
- (2) any Purchase Payments applied to the benefit base during or after the second Contract Year and prior to the enhanced benefit base date.

Charges for Withdrawals

If your total withdrawals in each Contract Year are equal to or less than the applicable Guaranteed Withdrawal Amount or Guaranteed Lifetime Withdrawal Amount, the withdrawal amounts will not be subject to any CDSC. If your total withdrawals in any Contract Year are greater than the applicable Guaranteed Withdrawal Amount or Guaranteed Lifetime Withdrawal Amount and the CDSC schedule is in effect, then the amount withdrawn in excess will be subject to a Contingent Deferred Sales Charge. See “Expenses – Contingent Deferred Sales Charge.”

Impact of Withdrawals on Contract Value

Withdrawals will reduce your Contract Value by the amount of the withdrawal and any applicable CDSC.

Impact of Withdrawals on the Death Benefit

If you elect MassMutual Lifetime Payment Plus, when you make withdrawals we will reduce the value of the death benefit as described in each death benefit calculation. See “Death Benefit – Basic Death Benefit” and “Additional Benefits – Annual Ratchet Death Benefit.”

The Settlement Phase

Your Contract enters the settlement phase if the benefit base is greater than zero, but your Contract Value falls below the minimum Contract Value we allow after a partial withdrawal. See “Withdrawals.”

During the settlement phase we will make settlement payments, but all other rights and benefits under the Contract, including death benefits, will terminate and we will not accept additional Purchase Payments. Additionally, we will no longer deduct the charge for MassMutual Lifetime Payment Plus. For tax reporting purposes we report settlement payments as Annuity Payments.

We determine the settlement payment amounts as follows:

- If on or after the Guaranteed Lifetime Withdrawal Date, your Contract Value falls below the minimum Contract Value we allow after a partial withdrawal, then we will commence to pay settlement payments each Contract Year in an amount equal to the Guaranteed Lifetime Withdrawal Amount. Settlement payments will end when there is no longer a surviving covered person.
- If prior to the Guaranteed Lifetime Withdrawal Date, your Contract Value falls below the minimum Contract Value we allow after a partial withdrawal, then we will commence to pay settlement payments each Contract Year in an amount equal to 5% of the benefit base at the time the Contract enters the settlement phase. Settlement payments will end when there is no longer a surviving covered person.

We will pay settlement payments no less frequently than annually.

If the Owner of a Qualified Contract dies and there is a surviving covered person who is not is not an “Eligible Designated Beneficiary” as defined in IRC Section 401(a)(9), settlement payments may only continue through the end of the calendar year that contains the tenth anniversary of death.

Choices upon the Latest Permissible Annuity Starting Date

Upon the latest permissible annuity starting date you must choose to terminate the Contract or your Contract must enter the Income Phase. The latest permissible annuity starting date is discussed in “The Income Phase – Annuity Payment Start Date.”

If you enter the Income Phase upon the latest permissible annuity starting date:

- you may elect one of the available Annuity Options described in “The Income Phase” and apply your Contract Value to that Annuity Option; or
- you may elect to receive Annuity Payments each Contract Year in an amount equal to the Guaranteed Lifetime Withdrawal Amount and we will pay such Annuity Payments until there is no longer a surviving covered person. If the Owner of a Qualified Contract dies and there is a surviving covered person who is not is not an “Eligible Designated Beneficiary” as

defined in IRC Section 401(a)(9), Annuity Payments may only continue through the end of the calendar year that contains the tenth anniversary of death.

Once Annuity Payments begin all other rights and benefits under the Contract, including death benefits, will terminate and we will no longer accept additional Purchase Payments. We will also no longer deduct the charge for MassMutual Lifetime Payment Plus. For more information about Annuity Options see "The Income Phase."

Payment of the Contract's Death Benefit and MassMutual Lifetime Payment Plus

- If you have an election of MassMutual Lifetime Payment Plus and a death benefit is paid from the Contract:
- if the Beneficiary takes the death benefit in a lump sum under the terms of the Contract, MassMutual Lifetime Payment Plus will no longer be in effect;
- if the Beneficiary does not take the death benefit in a lump sum, then:
 - If the deceased Owner (or the Annuitant, if the Owner is a non-natural person) is the last surviving covered person, MassMutual Lifetime Payment Plus will no longer be in effect. If the Beneficiary is the covered person's spouse, he or she may continue the Contract and apply for a new MassMutual Lifetime Payment Plus subject to availability and our then current rules and fees.
 - If the deceased Owner (or the Annuitant, if the Owner is a non-natural person) is not the last surviving covered person, MassMutual Lifetime Payment Plus will continue provided the covered person is eligible to and elects to continue the Contract as their own.

Allocation Restrictions

If you elect MassMutual Lifetime Payment Plus, you must participate in an approved Asset Allocation Program. See "Transfers and Transfer Programs – Asset Allocation Programs." If you elect MassMutual Lifetime Payment Plus, you cannot participate in the Separate Account Dollar Cost Averaging Program, the Interest Sweep Option, a DCA Fixed Account or the Automatic Rebalancing Program. Additionally, you cannot make allocations to The Fixed Accounts.

Additional Restrictions

If you elect MassMutual Lifetime Payment Plus, you may not elect a Guaranteed Minimum Accumulation Benefit or a Guaranteed Minimum Income Benefit.

Termination of MassMutual Lifetime Payment Plus

The MassMutual Lifetime Payment Plus feature will terminate upon the earlier of:

- the date a death benefit is payable and the Beneficiary takes the death benefit as a lump sum under the terms of the Contract;
- the date the full Contract Value is applied to an Annuity Option;
- the date your Contract Value and the benefit base both equal zero;
- the date there is no longer a surviving covered person;
- the Business Day we receive in Good Order at our Service Center your request (submitted on our form) to terminate the feature; or
- the date the Contract is terminated.

If the MassMutual Lifetime Payment Plus feature is terminated, it cannot be re-elected.

Cost of MassMutual Lifetime Payment Plus

If you elect MassMutual Lifetime Payment Plus, we will deduct a charge from your Contract Value in the Funds. The charge is equal, on an annual basis, to a percentage of the benefit base as of the date the charge is deducted. We may increase this

charge at any time while you own the Contract, but the charge will never exceed 1.50%. We will deduct the charge quarterly in arrears while the feature remains in effect, commencing on the first quarter of your first Contract Year. Should you enter the settlement phase, apply your full

Contract Value to an Annuity Option, cancel this feature or fully surrender your Contract, the final charge for this feature will occur on the immediately preceding Contract Year quarter. Currently, the charge is as follows: MassMutual Lifetime Payment Plus – Single Life 0.60%; MassMutual Lifetime Payment Plus – Joint Life 0.85%.

Important MassMutual Lifetime Payment Plus Considerations

This feature may not be appropriate for all Owners. You should understand MassMutual Lifetime Payment Plus completely before you elect this feature.

MassMutual Lifetime Payment Plus does not in any way guarantee the performance of any of the investment choices available under the Contract.

Postponing withdrawals may positively impact the benefit base as described in “MassMutual Lifetime Payment Plus – Credits to the Benefit Base” earlier in this section. However, if you postpone the taking of withdrawals, you may limit the value of this feature because your remaining life expectancy shortens as you age.

Excess withdrawals may significantly reduce or eliminate the value of the guarantees provided by this feature. Excess withdrawals are those in excess of the Guaranteed Lifetime Withdrawal Amount or, if taken prior to the youngest covered person reaching Age 60, excess withdrawals are those in excess of the Guaranteed Withdrawal Amount.

Because the charge for MassMutual Lifetime Payment Plus is a percentage of the benefit base, an increase in the benefit base will result in an increase in the cost of the feature.

Please consult with a qualified financial professional when you are evaluating MassMutual Lifetime Payment Plus and all other aspects of the Contract.

Equalizer Benefit

For examples of the operation of this benefit, see “Appendix P – Equalizer Benefit Examples.”

For an additional charge, at time of Contract issue you can elect the equalizer benefit. The equalizer benefit provides a credit at the end of the following benefit periods:

- the tenth Contract Year; and
- every five year Contract period thereafter.

You could only elect this additional feature at the time you apply for a Contract. You may cancel this feature at any time. The cancellation will be effective on the Contract Anniversary following your request.

We will pay the equalizer benefit only until you or the oldest Joint Owner (or an Annuitant, if the Owner is a non-natural person) reaches Age 80. You may not elect the equalizer benefit if you or the oldest Joint Owner (or an Annuitant, if the Owner is a non-natural person) is Age 70 or older when we issue your Contract.

References to Age

Age is as of the nearest birthday. For example, Age 80 is generally the period of time between age 79 years, 6 months and 1 day and age 80 and 6 months. See “Age.”

Cost of the Equalizer Benefit

If you elected the equalizer benefit, we deduct an additional charge of 0.50% while the feature is in effect. We may increase this charge at any time while you own the Contract, but the charge will never exceed 0.60%. We will assess this charge while the benefit is in effect.

In the first Contract Year, the charge is a percentage of your Purchase Payments. On the last day of your first Contract Year and on the last day of each Contract Year thereafter, the annual charge is a percentage of your Contract Value on that date. We may increase the current charge at any time while you own the Contract, but it will never exceed the maximum charge. For additional detail on charge deduction see “Additional Benefits – Charges for Additional Features.”

How is the Credit Calculated?

We base the credit on 10% of net earnings for each benefit period. The credit will never be less than zero. For the initial benefit period, we define earnings as the difference between your Contract Value and your Purchase Payments (less withdrawals) made during the benefit period.

For subsequent benefit periods after the tenth Contract Year, we define earnings as:

- (1) your Contract Value at the end of the benefit period;
- (2) minus your Contract Value at the end of the immediately preceding benefit period;
- (3) minus your Purchase Payments during the just ended benefit period;
- (4) plus withdrawals made during the just ended benefit period;
- (5) minus the equalizer benefit from the immediately preceding benefit period.

We consider requests to apply part of your Contract Value to an Annuity Option as a withdrawal for purposes of calculating the equalizer benefit. We will not count benefits that are paid as earnings when we determine the earnings amount for the subsequent benefit period. If you terminate this benefit during a benefit period, we will not pay you any benefit for that benefit period.

We will limit individual payments of the benefit to 40% of the amount of your total Purchase Payments less any withdrawals.

Withdrawals

Your ability to take a withdrawal may be restricted by certain provisions of the Internal Revenue Code. Furthermore, if your Contract is issued under a qualified plan, your ability to take a withdrawal may be restricted by your plan documents. Income taxes, tax penalties, a CDSC and certain restrictions may apply to any withdrawal you make.

During the Accumulation Phase you may make either partial or full withdrawals of your Contract Value. When making a partial withdrawal, you must withdraw at least \$100. We reserve the right to increase the minimum withdrawal amount to \$250. We reserve the right to limit you to one partial withdrawal per Contract Year.

You may only make a partial withdrawal if at least \$2,000 in Contract Value remains following the partial withdrawal, unless the payment is under a Systematic Withdrawal Program (SWP) and the withdrawal is an RMD or is made under a SWP intended to qualify as a series of substantially equal periodic payments for purposes of avoiding the additional 10% tax applicable to distributions that occur prior to age 59½. If you are participating in MassMutual Lifetime Income Protector, MassMutual Lifetime Payment Plus, GMIB 5, or GMIB 6, we do not require a minimum Contract Value following a partial withdrawal. Otherwise, you may only make a full withdrawal. We take any partial withdrawal proportionally from your Contract Value in your selected investment choices.

Where we reflect a reduction as a percentage of Contract Value withdrawn, the death benefit may be reduced by more than the actual dollar amount of the withdrawal. The reduction will be greater when the value of your Contract investment choices is lower due to market performance or other variables.

Withdrawals reduce the value of the Contract's death benefit. Withdrawals also reduce the value of any Guaranteed Minimum Accumulation Benefit or Guaranteed Minimum Income Benefit. Withdrawals taken prior to the Guaranteed Lifetime Withdrawal Date or in excess of the Guaranteed Lifetime Withdrawal Amount will reduce the value of any MassMutual Lifetime Payment Plus benefit. Excess withdrawals will reduce the value of any MassMutual Lifetime Income Protector benefit. We describe the impact of withdrawals under each feature's section in “Additional Benefits.”

If you withdraw your full Contract Value, the Contract terminates and does not provide a death benefit, a Guaranteed Minimum Accumulation Benefit or the Basic GMIB. However, MassMutual Lifetime Income Protector, MassMutual Lifetime Payment Plus, GMIB 5 and GMIB 6 features may still provide a benefit if you make a full withdrawal. See “Additional Benefits.”

When you make a full withdrawal you will receive your Contract Value:

- less any applicable CDSC;
- less any applicable interest rate factor adjustment;
- less any applicable Premium Tax;
- less any applicable annual contract maintenance charge; and
- less any Purchase Payments we credited to your Contract that have not cleared the bank, until they clear the bank.

See “Appendix E – Contingent Deferred Sales Charge Example.”

Requests in Writing

To request a withdrawal in writing, submit either a partial withdrawal or full withdrawal form in Good Order to our Service Center. If your withdrawal involves an exchange or transfer of assets to another financial institution, we also require a “letter of acceptance” from the financial institution.

Requests by Other Means

You may request certain partial and full withdrawals by other means we authorize such as email, telephone, or fax. Contact our Service Center for details.

Withdrawal Effective Date

For Written Requests, your withdrawal is effective on the Business Day we receive, in Good Order at our Service Center:

- a partial withdrawal or full withdrawal form acceptable to us; and
- if applicable, a “letter of acceptance.”

If we receive this/these item(s) at our Service Center on a Non-Business Day or after the Close of Business, your withdrawal request will be effective on the next Business Day. For email, telephone or fax requests, your withdrawal is effective on the Business Day we receive your request in Good Order, provided it is received prior to the Close of Business. For requests received after the Close of Business, your withdrawal will be effective on the next Business Day.

Delivery of Withdrawal Amount

We will pay any withdrawal amount within seven calendar days of the withdrawal effective date unless we are required to suspend or postpone withdrawal payments. See “Other Information – Payments We Make.”

We will pay any full or partial withdrawal to the qualified plan trustee or plan administrator, if you purchased your Contract under a qualified retirement plan, a non-qualified deferred compensation plan or a deferred compensation plan for a tax-exempt organization. The only exceptions are for RMD payments and for withdrawals from individually-owned Qualified Contracts.

Systematic Withdrawal Program

For detailed rules and restrictions pertaining to this program and instructions for electing the program contact our Service Center.

If you are participating in MassMutual Lifetime Income Protector, different rules may apply regarding the SWP. See “Additional

The Systematic Withdrawal Program (SWP) allows you to set up automatic periodic withdrawals from your Contract Value. We do not charge you for participation in the SWP. We will take any withdrawal under this program proportionally from your Contract Value in your selected investment choices. You may not participate in the SWP if you elected the Nursing Home Waiver Benefit and we are currently waiving the Contingent Deferred Sales Charge in accordance with that benefit.

Your SWP will end:

- if you withdraw your total Contract Value;
- if we receive, in Good Order, a notification of the Owner's death;
- if we receive, in Good Order, a notification of the Annuitant's death if the Owner is a non-natural person;
- if we process the last withdrawal for the period you selected, if applicable;
- if the next systematic withdrawal will lower your Contract Value below the minimum Contract Value we allow following a partial withdrawal, unless your withdrawal is an RMD or is made under a SWP intended to qualify as a series of substantially equal periodic payments for purposes of avoiding the additional 10% tax applicable to distributions that occur prior to age 59½;
- if the MassMutual Guaranteed Income Plus 5 or MassMutual Guaranteed Income Plus 6 is in effect and your next systematic withdrawal will cause withdrawals in the current Contract Year to exceed the current Contract Year interest credited on your GMIB value;
- if MassMutual Lifetime Payment Plus is in effect and your next systematic withdrawal will cause withdrawals in the current Contract Year to exceed the Guaranteed Lifetime Withdrawal Amount or the Guaranteed Withdrawal Amount;
- if you apply your full Contract Value to an Annuity Option; or
- if you give us a Written Request or request over the telephone, in Good Order, to terminate your program any time on or before the next withdrawal date. If your Contract is a Beneficiary IRA, your SWP cannot be terminated.

If MassMutual Lifetime Income Protector is in effect and you make withdrawals outside of the SWP, there are specific conditions under which we will halt the SWP through the remainder of a current Contract Year. See "Additional Benefits – MassMutual Lifetime Income Protector – Withdrawals On or After the Income Eligibility Date – Withdrawals Outside of the SWP.

Taxes

The information in this prospectus is general and is not an exhaustive discussion of all tax questions that might arise under the Contract. The information is not written or intended as tax or legal advice. You should consult a tax adviser about your own circumstances. In addition, we do not profess to know the likelihood that current federal income tax laws and Treasury Regulations or the current interpretations of the Internal Revenue Code, Regulations, and other guidance will continue. We cannot make any guarantee regarding the future tax treatment of any Contract. We reserve the right to make changes in the Contract to assure that it continues to qualify as an annuity for tax purposes.

No attempt is made in this prospectus to consider any applicable state or other tax laws.

Taxation of the Company

MassMutual is taxed as a life insurance company under the Internal Revenue Code of 1986, as amended (IRC). For federal income tax purposes, the Separate Account is not a separate entity from MassMutual, and its operations form a part of MassMutual.

Investment income and any realized gains on Separate Account assets generally are reflected in the Contract Value, although treated as accruing to the Company and not to you. As a result, no taxes are due currently on interest, dividends and short or long-term gains earned by the Separate Account with respect to your Contract. The Company may be entitled to certain tax benefits related to the investment of Company assets, including assets of the Separate Account. These tax benefits, which may include foreign tax credits and the corporate dividends received deduction, are not passed back to you since the Company is the owner of the assets from which the tax benefits are derived.

Annuities in General

Annuity contracts are a means of both setting aside money for future needs — usually retirement — and for providing a mechanism to administer the payout of those funds. Congress recognized how important providing for retirement was and created special rules in the IRC for annuities. Simply stated, these rules provide that you will generally not be taxed on the earnings on the money held in your annuity contract until you take the money out. This is referred to as tax deferral.

Diversification

IRC Section 817(h) imposes certain diversification standards on the underlying assets of variable annuity contracts. The IRC provides that a variable annuity contract will not be treated as an annuity contract for any period (and any subsequent period) for which the investments are not, in accordance with regulations prescribed by the United States Treasury Department, adequately diversified. Disqualification of the Contract as an annuity contract would result in a loss of tax deferral, meaning the imposition of federal income tax to the Owner with respect to earnings under the Contract prior to the receipt of payments under the Contract. We intend that all investment portfolios underlying the Contracts will be managed in such a manner as to comply with these diversification requirements.

Investor Control of Assets

For variable annuity contracts, tax deferral also depends on the insurance company, and not you, having control of the assets held in the Separate Accounts. You can transfer among the Sub-Accounts but cannot direct the investments each underlying Fund makes. If you have too much investor control of the assets supporting the Separate Account Funds, then you will be taxed on the gain in the Contract as it is earned rather than when it is withdrawn. The IRS has provided some guidance on investor control by issuing Revenue Rulings 2003-91 and 2003-92, but some issues remain unclear. One unanswered question is whether an Owner will be deemed to own the assets in the contract if a variable contract offers too large a choice of Funds in which to invest, and if so, what that number might be. We do not know if the IRS will issue any further guidance on this question. We do not know if any guidance would have a retroactive effect. Consequently, we reserve the right to modify the Contract, as necessary, so that you will not be treated as having investor control of the assets held under the Separate Account.

Non-Qualified Contracts

Your Contract is referred to as a Non-Qualified Contract if you do not purchase the Contract under a qualified plan such as an Individual Retirement Annuity (IRA), Roth IRA, tax-sheltered annuity plan (TSA or TSA plan), corporate pension and profit-sharing plan (including 401(k) plans and H.R. 10 plans), or a governmental 457(b) deferred compensation plan.

Qualified Contracts

Your Contract is referred to as a Qualified Contract if it is purchased under a qualified retirement plan (qualified plan) such as an Individual Retirement Annuity (IRA), Roth IRA, tax-sheltered annuity plan (TSA or TSA plan), corporate pension and profit-sharing plan (including 401(k) plans and H.R. 10 plans), or a governmental 457(b) deferred compensation plan. Qualified plans are subject to various limitations on eligibility, contributions, transferability and distributions based on the type of plan. The tax rules regarding qualified plans are very complex and will have differing applications depending on individual facts and circumstances. You should consult a tax adviser as to the tax treatment and suitability of such an investment.

Taxation of participants in each qualified plan varies with the type of plan and terms and conditions of each specific plan. Owners, annuitants and beneficiaries are cautioned that benefits under a qualified plan may be subject to the terms and conditions of the plan regardless of the terms and conditions of the contracts issued pursuant to the plan. Some retirement plans are subject to distribution and other requirements that are not incorporated into our administrative procedures. Owners, participants and beneficiaries are responsible for determining that contributions, distributions and other transactions with respect to the contracts comply with applicable law.

Contracts issued under a qualified plan include special provisions restricting contract provisions that may otherwise be available as described in this prospectus. Generally, contracts issued under a qualified plan are not transferable. Various penalty and excise taxes

may apply to contributions or distributions made in violation of applicable limitations. Furthermore, certain withdrawal penalties and restrictions may apply to distributions from qualified Contracts. See “Taxes – Taxation of Qualified Contracts.”

Eligible rollover distributions from an IRA, TSA, qualified plan or governmental 457(b) deferred compensation plan may generally be rolled over into another IRA, TSA, qualified plan or governmental 457(b) deferred compensation plan, if permitted by the plan.

These amounts may be transferred directly from one qualified plan or account to another, or as an indirect rollover, in which the plan participant receives a distribution from the qualified plan or account, and reinvests it in the receiving qualified plan or account within 60 days of receiving the distribution.

IRC Section 408(d)(3)(B) provides that an individual is only permitted to make one indirect rollover from an IRA to another IRA in any 1-year period. The IRS previously applied this limitation on an IRA-by-IRA basis, allowing a taxpayer to make an indirect rollover from an IRA, so long as he or she had not made an indirect rollover from that same IRA within the preceding 1-year period, even if he or she had made indirect rollovers from a different IRA. Effective for distributions on or after January 1, 2015 the limitation applies on an aggregate basis, meaning that an individual cannot make an indirect rollover from one IRA to another if he or she has made an indirect rollover involving any IRA (including a Roth, SEP, or SIMPLE IRA) within one year.

It is important to note that the one rollover per year limitation does not apply to amounts transferred directly between IRAs in a trustee-to-trustee transfer.

On July 6, 1983, the Supreme Court decided in *Arizona Governing Committee v. Norris* that optional annuity benefits provided under an employer’s deferred compensation plan could not, under Title VII of the Civil Rights Act of 1964, vary between men and women. The Contracts we sell in connection with employer-sponsored qualified plans use annuity tables which do not differentiate on the basis of sex. Such annuity tables are also available for use in connection with certain non-qualified deferred compensation plans.

Following are general descriptions of the types of qualified plans with which the Contracts may be used. Such descriptions are not exhaustive and are for general informational purposes only. The tax rules regarding qualified plans are very complex and will have differing applications depending on individual facts and circumstances. You should consult a tax adviser as to the tax treatment and suitability of your investment. The contribution limits referenced in the plan descriptions below are the limits for 2024, and may change in subsequent years.

Individual Retirement Annuities

IRC Section 408(b) permits eligible individuals to contribute to an individual retirement program known as an Individual Retirement Annuity (IRA). IRAs are subject to limitations on eligibility, contributions, transferability and distributions. See “Taxes – Taxation of Qualified Contracts.” IRA contributions are limited to the lesser of \$7,000 or 100% of compensation, and an additional catch-up contribution of \$1,000 is available for individuals age 50 and over. Contributions are deductible, unless you are an active participant in a qualified plan and your modified adjusted gross income exceeds certain limits. Contracts issued for use with IRAs are subject to special requirements by the IRC, including the requirement that certain informational disclosure be given to persons desiring to establish an IRA. You should consult a tax adviser as to the tax treatment and suitability of such an investment.

SEP IRAs

IRC Section 408(k) permits certain employers to establish IRAs for employees that qualify as Simplified Employee Pension (SEP) IRAs. Contributions to the plan for the benefit of employees will not be includible in the gross income of the employees until distributed from the plan. SEP IRAs are treated as defined contribution plans for purposes of the limits on employer contributions. Employer contributions cannot exceed the lesser of:

- \$69,000; or
- 25% of compensation (a maximum of \$345,000 of compensation may be considered).

The employee may treat the SEP account as a traditional IRA and make deductible and non-deductible contributions if the general IRA requirements are met. SEP IRAs are subject to additional restrictions, including on items such as: the form, manner and timing of distributions; transferability of benefits; vesting and nonforfeiture of interests; nondiscrimination in eligibility and participation; and the tax treatment of distributions, withdrawals, and surrenders. See “Taxes – Taxation of Qualified Contracts.” You should consult a tax adviser as to the tax treatment and suitability of such an investment.

SIMPLE IRAs

IRC Section 408(p) permits certain small employers to establish a Savings Incentive Match Plan for Employees (SIMPLE) IRA. SIMPLE IRA plans permit employees to make elective contributions only through a qualified salary reduction agreement.

Employers can make contributions to the plan through either matching contributions or non-elective contributions. An employee's annual elective salary reduction contributions are limited to the lesser of \$16,000 or 100% of compensation, and an additional catch-up contribution is available for individuals age 50 and over, up to the lesser of \$3,500 or total compensation less any other elective deferrals. Elective contributions made to a SIMPLE IRA are counted against the overall limit on elective deferrals by any individual (the lesser of \$23,000 or 100% of compensation). The employer must make certain matching contributions or non-elective contributions to the employee's account. SIMPLE IRAs are subject to additional restrictions, including on items such as: the form, manner and timing of distributions; transferability of benefits; vesting and nonforfeitability of interests; nondiscrimination in eligibility and participation; and the tax treatment of distributions, withdrawals, and surrenders. See "Taxes – Taxation of Qualified Contracts." You should consult a tax adviser as to tax treatment and suitability of such an investment.

Roth IRAs

IRC Section 408A permits eligible individuals to contribute to a non-deductible IRA, known as a Roth IRA. Roth IRAs are subject to limitations on eligibility, contributions, transferability and distributions. Roth IRA contributions are limited to the lesser of \$7,000 or 100% of compensation, and an additional catch-up contribution of \$1,000 is available for individuals age 50 or over. The maximums are decreased by any contributions made to a traditional IRA for the same tax year. Lower maximum Roth IRA contribution limits apply to individuals whose modified adjusted gross income exceeds certain limits. Amounts may be rolled over from one Roth IRA to another Roth IRA. Furthermore, an individual may make a rollover contribution from a non-Roth IRA to a Roth IRA, known as a conversion. The individual must pay tax on any portion of the IRA being rolled over that represents income or previously deductible IRA contributions. The determination of taxable income is based on the fair market value of the IRA at the time of the conversion. See "Taxes – Required Minimum Distributions for Qualified Contracts" for information on the determination of the fair market value of an annuity contract that provides additional benefits (such as certain living or death benefits). You should consult a tax adviser as to the tax treatment and suitability of such an investment.

Corporate Pension and Profit-Sharing Plans

IRC Sections 401(a) and 401(k) permit employers to establish various types of retirement plans for employees. Contributions made to the plan for the benefit of the employees and the earnings on those contributions are generally not included in gross income of the employees until distributed from the plan. The tax consequences to plan participants may vary depending upon the particular plan design. In general, annual contributions made by an employer and employee to a defined contribution plan may not exceed the lesser of:

- \$69,000; or
- 100% of compensation or earned income (a maximum of \$345,000 of compensation may be considered).

An employee's elective salary reduction contributions under a cash or deferred arrangement (i.e. a 401(k) plan) are limited to \$23,000, with an additional catch-up contribution of up to \$7,500 available for eligible plan participants age 50 or over.

Defined benefit plans are limited to contributions necessary to fund a promised level of benefit. The annual benefit under a defined benefit plan is limited to:

- 100% of compensation for a plan participant's highest three years; or
- \$275,000.

Plans are subject to additional restrictions, including on such items as: the form, manner and timing of distributions; transferability of benefits; vesting and nonforfeitability of interests; nondiscrimination in eligibility and participation; and the tax treatment of distributions and withdrawals. See "Taxes – Taxation of Qualified Contracts." You should consult a tax adviser as to the tax treatment and suitability of such an investment.

H.R. 10 Plans

IRC Section 401(a) permits self-employed individuals to establish qualified plans for themselves and their employees, commonly referred to as “H.R. 10” or “Keogh” plans. Contributions made to the plan for the benefit of the employees and the earnings on those contributions are generally not included in gross income of the employees until distributed from the plan. The tax consequences to plan participants may vary depending upon the particular plan design.

In general, H.R. 10 Plans are subject to the same restrictions as corporate pension and profit-sharing plans (see “Taxes – Qualified Contracts – Corporate Pension and Profit-Sharing Plans”), including limitations on eligibility, participation, contributions, time and manner of distributions, transferability and taxation of distributions. See “Taxes – Taxation of Qualified Contracts.” You should consult a tax adviser as to the tax treatment and suitability of such an investment.

Tax-Sheltered Annuities

IRC Section 403(b) permits certain eligible employers to purchase annuity contracts, known as Tax-Sheltered Annuities (TSAs), under a section 403(b) program. Eligible employers are organizations that are exempt from tax under IRC Section 501(c)(3) and public educational organizations. Contributions made to a TSA and the earnings on those contributions are generally not included in gross income of the employee until distributed from the plan. TSAs are subject to limitations on contributions, which may be made as “elective deferrals” (contributions made pursuant to a salary reduction agreement) or as non-elective or matching contributions by an employer. In general, annual contributions made by an employer and employee to a TSA may not exceed the lesser of:

- \$69,000; or
- 100% of includible compensation (a maximum of \$345,000 of includible compensation may be considered).

An employee’s elective salary reduction contributions are limited to \$23,000. In addition, certain catch-up contributions may be made by eligible plan participants age 50 or over and those with 15 or more years of service with the same employer. TSAs are subject to additional restrictions, including on such items as: the form, manner and timing of distributions; transferability of benefits; vesting and nonforfeiture of interests; nondiscrimination in eligibility and participation; and the tax treatment of distributions, withdrawals and surrenders. See “Taxes – Tax-Sheltered Annuities Taxation and Withdrawal Restrictions.” You should consult a tax adviser as to the tax treatment and suitability of such an investment.

Taxation of Non-Qualified Contracts

You, as the Owner of a non-qualified annuity, will generally not be taxed on any increases in the value of your Contract until a distribution occurs. There are different rules as to how you are taxed depending on whether the distribution is a withdrawal or an Annuity Payment.

Withdrawals

The IRC generally treats any withdrawal (1) allocable to investment in the Contract made after August 13, 1982 in an annuity contract entered into prior to August 14, 1982 and (2) from an annuity contract entered into after August 13, 1982, as first coming from earnings and then from your investment in the Contract. The withdrawn earnings are subject to tax as ordinary income.

Annuity Payments

Annuity Payments occur as the result of the Contract reaching its annuity starting date. A portion of each Annuity Payment is treated as a partial return of your investment in the Contract and is not taxed. The remaining portion of the Annuity Payment is treated as ordinary income. The Annuity Payment is divided between these taxable and non-taxable portions based on the calculation of an exclusion amount. The exclusion amount for Annuity Payments based on a fixed Annuity Option is determined by multiplying the payment by the ratio that the cost basis of the Contract (adjusted for any period certain or refund feature) bears to the expected return under the Contract.

The exclusion amount for Annuity Payments based on a variable Annuity Option is determined by dividing the cost basis of the Contract (adjusted for any period certain or refund guarantee) by the number of years over which the annuity is expected to be paid. Annuity Payments received after you have recovered all of your investment in the Contract are fully taxable.

The IRC also provides that any amount received (both Annuity Payments and withdrawals) under an annuity contract which is included in income may be subject to an additional income tax. The additional tax is equal to 10% of the amount that is includible in income. Some withdrawals will be exempt from the additional tax. They include any amounts:

- (1) paid on or after you reach age 59½;
- (2) paid to your Beneficiary after you die;
- (3) paid if you become totally disabled (as that term is defined in the IRC);
- (4) paid in a series of substantially equal periodic payments made annually (or more frequently) for your life or life expectancy or for the joint lives or joint life expectancies of you and your designated Beneficiary. Annuity Payments may qualify for this exception if they satisfy the RMD rules applicable to Annuity Payments from qualified plans and IRAs;
- (5) paid under an immediate annuity; or
- (6) which come from investment in the Contract made before August 14, 1982.

With respect to (4) above, if the series of substantially equal periodic payments is modified before the later of your attaining age 59½ or five years from the date of the first periodic payment, then the tax for the year of the modification is increased by an amount equal to the tax which would have been imposed (the 10% additional tax), but for the exception, plus interest for the tax years in which the exception was used. A withdrawal outside of the series of substantially equal period payments, or an additional Purchase Payment into your Contract, may be considered an impermissible modification. However, after 2023, a tax-free rollover or transfer to another qualified plan or IRA, from which a series of substantially equal periodic payments is received, will not result in a modification if the combined distributions from the old and new arrangements continue to satisfy the exception. The rules governing substantially equal periodic payments are complex. You should consult a tax adviser for more specific information.

Multiple Contracts

The IRC provides that multiple non-qualified annuity contracts which are issued within a calendar year to the same Owner by one company or its affiliates are treated as one deferred annuity contract for purposes of determining the tax consequences of any distribution. Such treatment may result in adverse tax consequences including more rapid taxation of the distributed amounts from such combination of contracts. This rule does not apply to immediate annuities.

Tax Treatment of Assignments

An assignment or pledge of a Contract may be a taxable event. You should consult a tax adviser if you wish to assign or pledge your Contract. Annuity contracts issued after April 22, 1987 that are transferred for less than full and adequate consideration (including gifts) are subject to tax to the extent of gain in the Contract. This does not apply to transfers between spouses or certain transfers incident to a divorce under IRC Section 1041.

Distributions After Death of an Owner

In order to be treated as an annuity contract for federal income tax purposes, IRC Section 72(s) requires any Non-Qualified Contract to contain certain provisions specifying how your interest in the Contract will be distributed in the event of the death of an Owner of the Contract. Specifically, IRC Section 72(s) requires that:

- (a) if any Owner dies on or after the annuity starting date, but prior to the time the entire interest in the Contract has been distributed, the entire interest in the Contract will be distributed at least as rapidly as under the method of distribution being used as of the date of such Owner's death; and
- (b) if any Owner dies prior to the annuity starting date, the entire interest in the Contract will be distributed within five years after the date of such Owner's death.

These requirements will be considered satisfied as to any portion of an Owner's interest which is payable to or for the benefit of a designated Beneficiary and which is distributed over the life of such designated Beneficiary or over a period not extending beyond the life expectancy of that Beneficiary, provided that such distributions begin within one year of the Owner's death. The designated Beneficiary refers to a natural person designated by the Owner as a Beneficiary and to whom ownership of the Contract passes by reason of death. However, if the designated Beneficiary is the surviving spouse of the deceased Owner, the Contract may be continued with the surviving spouse as the new Owner. The Non-Qualified Contracts contain provisions that are intended to comply with these IRC requirements, although no regulations interpreting these requirements have yet been issued. We intend to review such provisions

and modify them if necessary to assure that they comply with the applicable requirements when such requirements are clarified by regulation or otherwise.

Taxation of Qualified Contracts

If you have no cost basis for your interest in a Qualified Contract, the full amount of any distribution is taxable to you as ordinary income. If you do have a cost basis for all or some of your interest, a portion of the distribution is taxable, generally based on the ratio of your cost basis to your total Contract Value. Special tax rules may be available for certain distributions from a qualified plan.

IRC Section 72(t) imposes a 10% additional income tax on the taxable portion of any distribution from qualified plans, including Contracts issued and qualified under IRC Sections 401 (pension and profit-sharing plans), 403 (TSAs), 408 (IRAs), and 408A (Roth IRAs). With respect to SIMPLE IRAs, the 10% additional tax is increased to 25% if the distribution occurs within the first two years after the commencement of the employee's participation in the plan. Exceptions from the additional tax are as follows:

- (1) distributions made on or after you reach age 59½;
- (2) distributions made after your death;
- (3) distributions made that are attributable to the employee being disabled as defined in the IRC;
- (4) after severance from employment, distributions that are part of a series of substantially equal periodic payments made not less frequently than annually for your life (or life expectancy) or the joint lives (or joint life expectancies) of you and your designated Beneficiary (in applying this exception to distributions from IRAs, a severance of employment is not required). Annuity Payments may qualify for this exception if they satisfy the RMD rules applicable to Annuity Payments from qualified plans and IRAs;
- (5) distributions made after severance from employment if you have reached age 55, or after you have reached age 50 or 25 years of service for qualified public safety employees and private sector firefighters (not applicable to distributions from IRAs);
- (6) corrective distributions of amounts that exceed tax law limitations;
- (7) distributions made to you up to the amount allowable as a deduction to you under IRC Section 213 for amounts you paid during the taxable year for medical care;
- (8) distributions made on account of an IRS levy made on a qualified retirement plan or IRA;
- (9) distributions made to an alternate payee pursuant to a qualified domestic relations order (not applicable to distributions from IRAs);
- (10) distributions from an IRA for the purchase of medical insurance (as described in IRC Section 213(d)(1)(D)) for you and your spouse and dependents if you received unemployment compensation for at least 12 weeks and have not been re-employed for at least 60 days;
- (11) certain qualified reservist distributions;
- (12) distributions from an IRA to the extent they do not exceed your qualified higher education expenses (as defined in IRC Section 72(t)(7)) for the taxable year;
- (13) distributions from an IRA which are qualified first-time homebuyer distributions (as defined in IRC Section 72(t)(8));
- (14) distributions which are qualified birth or adoption distributions (as defined in IRC Section 72(t)(2)(H)). Such distributions can be recontributed within the three year period beginning on the date received;
- (15) certain distributions made after December 31, 2023 for emergency personal expenses (as provided in IRC Section 72(t)(2)(I)). Such distributions can be recontributed within the three-year period beginning on the date received;
- (16) eligible distributions made after December 31, 2023 to you if you are a victim of domestic abuse (as provided in IRC Section 72(t)(2)(K)). Such distributions may be recontributed within the three-year period beginning on the date received;
- (17) distributions made to you if you are a terminally ill individual (as provided in IRC Section 72(t)(2)(L)). Such distributions may be recontributed within the three-year period beginning on the date received; and
- (18) distributions that are qualified disaster recovery distributions under IRC Section 72(t)(2)(M). Such distributions may be recontributed within the three-year period beginning on the date received.

With respect to (4) above, if the series of substantially equal periodic payments is modified before the later of your attaining age 59½ or five years from the date of the first periodic payment, then the tax for the year of the modification is increased by an amount equal to the tax which would have been imposed (the 10% additional tax) but for the exception, plus interest for the tax years in which the

exception was used. A withdrawal outside of the series of substantially equal period payments, or an additional Purchase Payment into your Contract, may be considered an impermissible modification. However, after 2023, a tax-free rollover or transfer to another qualified plan or IRA, from which a series of substantially equal periodic payments is received, will not result in a modification if the combined distributions from the old and new arrangements continue to satisfy the exception. The rules governing substantially equal periodic payments are complex. You should consult a tax adviser or IRS Notice 2022-6 for more specific information.

Tax-Sheltered Annuities Taxation and Withdrawal Restrictions

Under IRS regulations, effective January 1, 2009, all TSA plans must have a written plan document which specifies the requirements that each Contract must meet in order to be qualified under the plan. In addition, the document must provide a list of the providers and Contracts that are permitted to be purchased by TSA plan participants under the plan. TSA plan participants should be aware that if a TSA plan removes the provider or specific contract type that the TSA plan participant owns from its approved list, the TSA plan participant may be restricted from making further salary reduction contributions into that contract. TSA plans also have the right to restrict the ability to take loans and hardship withdrawals from a TSA contract. Because a plan participant may own more than one TSA contract, before we process a transaction we may require the TSA plan to approve the transaction to ensure that rules regarding loans, hardships and distribution restrictions are met. TSA plan participants should contact their individual TSA plan to determine the specific rules that apply to them.

The IRS regulations also made significant changes to Revenue Ruling 90-24 exchanges or transfers. Under the regulations an exchange may only be done when the TSA plan allows TSA exchanges under its plan and the provider of the new TSA contract agrees to share information with the TSA plan to ensure that the requirements of the TSA plan are met. Given this restriction, before a TSA exchange is processed, the TSA plan is required to approve the transaction or provide a list of vendors for which it has an information sharing agreement (ISA). Additionally, because most of the regulations were not effective until 2009, there was great uncertainty about their application to contract exchanges that took place between September 24, 2007 and January 1, 2009. Because of this uncertainty, it is possible that an exchange that took place prior to January 1, 2009 caused a TSA plan participant to incur taxation on the value of the Contract. However, it is also possible that such an exchange did not have adverse tax consequences. If a TSA plan participant exchanged a contract to a TSA contract with a provider that does not have an ISA with the TSA plan, the participant had until July 1, 2009 to avoid adverse tax consequences by exchanging the contract for a TSA contract with which the TSA plan does have an ISA.

The IRC limits the withdrawal of purchase payments made by TSA plan participants through salary reductions from certain TSAs. Withdrawals of salary reduction amounts and their earnings can be made when a TSA plan participant:

- reaches age 59½;
- has a severance from employment;
- dies;
- becomes disabled, as that term is defined in the IRC;
- meets the requirements for a qualified birth or adoption distribution, as defined in IRC Section 72(t)(2)(H);
- qualifies for a qualified disaster recovery distribution, as defined in IRC Section 72(t)(2)(M);
- qualifies for an eligible distribution to a domestic violence victim, as defined in IRC Section 72(t)(2)(K);
- qualifies for an emergency personal expense distribution, as defined in IRC Section 72(t)(2)(I); or
- the TSA plan terminates (starting January 1, 2009).

In the case of hardship, for plan years beginning before 2024, the TSA plan participant could only withdraw the purchase payments and not any earnings. However, for plan years beginning after 2023, hardship withdrawals can consist of both the Purchase Payments and any earnings.

TSA Contract Value as of December 31, 1988 and Contract amounts attributable to service with a former employer are not subject to these restrictions. Additionally, return of excess contributions or amounts paid to a spouse as a result of a qualified domestic relations order are not subject to these restrictions.

TSA Contracts issued January 1, 2009 and after are subject to distribution restrictions on employer contributions. These restrictions are determined by the TSA plan and can be based on criteria such as completing years of service or attaining a stated age.

Required Minimum Distributions for Qualified Contracts

For Qualified Contracts other than Roth IRAs, distributions generally must begin no later than April 1st of the calendar year following the later of:

- (1) the calendar year in which you attained the “applicable age” as defined in IRC Section 401(a)(9); or
- (2) the calendar year in which you retire.

If you were born after December 31, 1950 and before January 1, 1960, your applicable age is 73. If you were born after December 31, 1959, your applicable age is 75. Previously, the age at which RMDs were required to begin was 70½ for those born before July 1, 1949, and 72 for those born after June 30, 1949 and before January 1, 1951.

The date set forth in (2) does not apply to an IRA or to a five percent owner of the employer maintaining the plan. Required distributions generally must be over a period not exceeding your life or life expectancy or the joint lives or joint life expectancies of you and your designated Beneficiary. Upon your death, additional distribution requirements are imposed. If your Contract is held as a Roth IRA, there are no RMDs during your life. However, upon your death your Beneficiary is subject to RMD requirements. If RMDs are not made, a penalty tax of up to 25% is imposed on the amount that should have been distributed.

These rules were significantly changed under the Setting Every Community Up for Retirement Enhancement (SECURE) Act, enacted in late 2019, and differ for Qualified Contracts when death occurs after December 31, 2019 versus those where death occurred on or before December 31, 2019 (on or before December 31, 2021 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement).

Where the Owner's death occurred on or before December 31, 2019 (on or before December 31, 2021 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement), if the Contract had not yet entered the Income Phase and death occurred after the required beginning date, distributions must be made at least as rapidly as under the method in effect at the time of the Owner's death, or over the life or life expectancy of the designated Beneficiary. If the Contract had not entered the Income Phase and death occurred before the required beginning date, the remaining interest must be distributed within five years or over the life or life expectancy of the designated Beneficiary. If the Owner's death occurred after the Contract had entered the Income Phase, distributions must be made at least as rapidly as under the method in effect at the time of the Owner's death.

If your death occurs after December 31, 2019 (after December 31, 2021 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement) and your designated Beneficiary is not an “Eligible Designated Beneficiary” as defined in IRC Section 401(a)(9), the remaining interest must be distributed within ten years, regardless of whether your death occurs before or after your required beginning date or whether your Contract had entered the Income Phase. In addition, if your death occurs on or after your required beginning date, proposed regulations under IRC Section 401(a)(9) would require annual RMDs during the ten year distribution period. If your designated Beneficiary is considered an Eligible Designated Beneficiary, the remaining interest must be distributed within ten years or over the life or life expectancy of the designated Beneficiary. We only offer a life or life expectancy distribution option to a designated beneficiary who either (1) is the surviving spouse of the deceased qualified plan participant or IRA owner or, (2) is not more than ten years younger than the deceased qualified plan participant or IRA owner. In the future, we may allow additional classes of Eligible Designated Beneficiaries to elect a life or life expectancy distribution option.

If your death occurs after December 31, 2019 (after December 31, 2021 for participants of a governmental plan or a plan maintained pursuant to a collective bargaining agreement) and you do not have a designated Beneficiary (including where your estate or certain trusts are the Beneficiary), the pre-2019 distribution rules generally apply. If your Contract has not yet entered the Income Phase and death occurs after your required beginning date, distributions must be made at least as rapidly as under the method in effect at the time of your death. If the Contract has not yet entered the Income Phase and your death occurs before your required beginning date, the remaining interest must be distributed within five years. If your death occurs after your Contract has entered the Income Phase, distributions must be made at least as rapidly as under the method in effect at the time of your death.

The Regulations under IRC Section 401(a)(9) include a provision that could increase the dollar amount of RMDs for individuals who fund their IRA or qualified retirement plan with an annuity contract. During the Accumulation Phase of the annuity Contract, Treasury Regulations Section 1.401(a)(9)-6, Q&A-12 requires that individuals add the actuarial present value of any additional benefits provided under the annuity (such as certain living or death benefits) to the dollar amount credited to the Owner or Beneficiary under the Contract in order to determine the fair market value of the Contract. A larger fair market value will result in the calculation of a higher RMD amount. You should consult a tax adviser to determine how this may impact your specific circumstances.

Partial Annuitization

The ability to apply only a portion of your Contract Value to an Annuity Option is commonly referred to as “partial annuitization” or “partially annuitizing.” Federal tax law provides favorable tax treatment of partial annuitization of a non-qualified annuity contract under certain circumstances. There may be tax consequences, possibly significant, to partially annuitizing a Qualified Contract. **You should consult a tax adviser before electing to partially annuitize your Contract.**

Partial Annuitization of Non-Qualified Contracts

As part of the Small Business Jobs Act of 2010, IRC Section 72 was amended to provide that if part of an annuity contract's value is applied to an Annuity Option that provides payments for one or more lives or for a period of at least ten years, the portion of the Contract that is annuitized will be treated as a separate Contract and Annuity Payments received as a result of the partial annuitization will be treated as amounts received as an annuity instead of withdrawals, and given exclusion ratio treatment. The exclusion ratio is calculated by allocating the current investment in the Contract between the amount applied to the Annuity Option and the remaining portion of the original Contract.

If the Annuity Option you elect does not meet one of the two above-described criteria, we will report all payments from your Contract, whether from the annuitized or the deferred portions of the Contract Value, to the IRS as a distribution with the taxable amount not determined beginning with the date of the partial annuitization. It is your responsibility to document to the IRS how much, if any, of a distribution is allocable to cost basis.

Partial Annuitization of Qualified Contracts

If you elect to apply only a portion of your qualified annuity Contract Value to an annuity option, we will treat the annuitized and non-annuitized portions of your Contract as separate Contracts for purposes of applying the Required Minimum Distribution (RMD) rules of IRC Section 401(a)(9) and the regulations thereunder. The IRS has not yet published guidance on the computation of the RMD for payments received as the result of a partial annuitization. If the IRS were to take the position that the annuitized and non-annuitized portions are not separate Contracts for RMD purposes, your distributions may not be sufficient to meet your RMD in the year of the partial annuitization and subsequent years. Failure to satisfy the RMD rules in any year could subject you to a penalty of up to 25% of the amount that should have been distributed but was not. If your Qualified Contract contains after-tax money (i.e. has a cost basis), we will allocate that cost basis pro-rata between the annuitized and non-annuitized portions. Because the IRS has not published guidance as to what portion of any payment made under the annuity option represents a non-taxable return of cost basis and what portion is taxable, this treatment may understate or overstate income in any given year. If you misstate your income, the IRS may impose tax penalties and interest. You should consult a tax or legal adviser to discuss these risks before electing a partial annuitization of your qualified deferred annuity contract.

Taxation of Death Benefit Proceeds

Amounts may be distributed from a Contract because of your death or the death of the Annuitant. Generally, such amounts are includible in the income of the recipient as follows:

- if distributed in a lump sum, they will be treated in the same manner as a full withdrawal from the Contract; or
- if distributed under a payout option, they will be treated as Annuity Payments.

Section 1035 Tax Free Exchanges

IRC Section 1035 provides that a life insurance, endowment, or annuity contract may be exchanged for an annuity contract on a tax free basis. When this type of exchange occurs, the gain in the original contract is preserved in the new contract by transferring the cost basis under the original contract to the new contract. The IRS has provided guidance on the partial exchange of an annuity contract for another annuity contract. According to the guidance, partial exchanges occurring on or after October 24, 2011 will be tax free if no distribution takes place from either contract within 180 days after the exchange. If a distribution occurs within 180 days after the exchange, the IRS will apply general tax principles to determine the tax treatment of the transfer. The limitation on distributions within 180 days does not apply to Annuity Payments that are based on life expectancy or on a period certain of ten or more years. You should consult a tax adviser before entering into any 1035 exchange.

Partial exchanges which occurred prior to October 24, 2011 were subject to more restrictive guidance. You should consult a tax adviser if you have questions regarding the taxation of a prior exchange.

Beginning January 1, 2010, the Pension Protection Act of 2006 permits the exchange of an annuity contract for a qualified long-term care contract to qualify as a tax free 1035 exchange. However, if an annuity contract has entered the Income Phase, there is uncertainty and a lack of guidance regarding whether the exchange can qualify. Therefore, if an annuity contract has entered the Income Phase and the Contract or the resulting Annuity Payments are exchanged for a qualified long-term care Contract, we will not treat that as a tax free 1035 exchange.

The IRS has also issued guidance allowing a beneficiary of a non-qualified annuity contract to enter into a 1035 exchange of the death benefit for a new annuity contract, provided that the new contract will be administered as if the Owner is deceased for purposes of the death benefit requirements of IRC Section 72(s). In order to allow the death benefit under a non-qualified annuity contract to be exchanged, we may require additional documentation from the issuer of the new contract, in order to ensure that this requirement is met.

Income Tax Reporting and Withholding

Federal law requires that we file an information return on Form 1099-R with the IRS (with a copy to you) reporting any taxable amounts paid to you under the annuity contract. By January 31 of the calendar year following the year of any payment(s), we will issue the Form 1099-R to the Owner of the annuity contract. Following the death of the Owner the Form 1099-R will be sent to each Beneficiary who receives a payment under the Contract.

The portion of any distribution that is includible in the gross income of the Owner is subject to federal income tax withholding. The amount of the withholding depends on the type of distribution. Withholding for periodic payments is at the same rate as wages and at the rate of 10% from non-periodic payments. However, the Owner, in most cases, may elect not to have taxes withheld or to have withholding done at a different rate. Distributions from certain retirement plans, excluding IRAs, that are not directly rolled over to another eligible retirement plan or IRA, are subject to a mandatory 20% withholding.

The 20% withholding requirement generally does not apply to:

- a series of substantially equal payments made at least annually for:
 - the life or life expectancy of the Owner, or joint and last survivor expectancy of the Owner and a designated Beneficiary, or
 - for a specified period of ten years or more;
- distributions which are RMDs;
- hardship distributions from a 401(k) plan or a tax-sheltered annuity; or
- distributions that are qualified birth or adoption distributions as defined in IRC Section 72(t)(2)(H).

You should consult a tax adviser regarding withholding requirements.

Generation Skipping Transfer Tax Withholding

Under certain circumstances, the IRC may impose a generation skipping transfer tax when all or part of an annuity contract is transferred to, or a death benefit is paid to, an individual two or more generations younger than the Owner. Regulations issued under the IRC may require us to deduct the tax from your Contract, or from any applicable payment, and pay it directly to the IRS.

Medicare Hospital Insurance Tax

A Medicare Hospital Insurance Tax (known as the Unearned Income Medicare Contribution) applies to all or part of a taxpayer's net investment income, at a rate of 3.8%, when certain income thresholds are met. Net investment income is defined to include, among other things, non-qualified annuities and net gain attributable to the disposition of property. Under final tax regulations, the taxable portion of any distribution from a non-qualified annuity contract – including surrenders, withdrawals, and Annuity Payments – is included in net investment income. Net investment income also includes the gain from the sale of a non-qualified annuity contract.

Under current guidance, we are required to report to the IRS whether a distribution is potentially subject to the tax. You should consult a tax adviser as to the potential impact of the Medicare Hospital Insurance Tax on your Contract.

Non-Resident Aliens and Foreign Entities

Generally, a distribution from a Contract to a non-resident alien or foreign entity is subject to federal tax withholding at a rate of 30% of the amount of income that is distributed. A non-resident alien is a person who is neither a citizen, nor a resident, of the United States of America (U.S.). We are required to withhold the tax and send it to the IRS. Some distributions to non-resident aliens or foreign entities may be subject to a lower (or no) tax if a treaty applies. In order to obtain the benefits of such a treaty, the non-resident alien must claim the treaty benefit on Form W-8BEN (or the equivalent form), providing us with:

- (1) proof of residency (in accordance with IRS requirements), and
- (2) the applicable taxpayer identification number.

If the above conditions are not met, we will withhold 30% of the income from the distribution. Additionally, under the Foreign Account Tax Compliance Act effective July 1, 2014, U.S. withholding may occur with respect to certain foreign entity owners (including foreign financial institutions and non-financial foreign entities (such as corporations, partnerships, and trusts)) at a 30% rate without regard to lower treaty rates.

Civil Unions and Domestic Partnerships

Parties to a civil union or domestic partnership are not treated as spouses under federal law. Consequently, certain transactions, such as a change of ownership or continuation of the Contract after death, may be taxable to those individuals. You should consult a tax adviser for more information on this subject.

Non-Natural Owner

When a Non-Qualified Contract is owned by a non-natural person (e.g., a corporation, limited liability company, partnership, trust or certain other entities) the Contract will generally not be treated as an annuity for tax purposes. This means that gain in the Contract will be taxed each year while the Contract is in the Accumulation Phase. This treatment is not generally applied to a Contract held by a trust or other entity as an agent for a natural person. If a trust is not a grantor trust for income tax purposes, and any beneficiary (including a contingent beneficiary) of the trust is a non-natural person, the Contract will not be treated as owned by an agent for a natural person, and gain in the Contract will be taxed annually.

Before purchasing a Contract to be owned by a non-natural person or changing ownership on an existing Contract that will result in it being owned by a non-natural person, you should consult a tax adviser to determine the tax impact.

Distribution

The Contracts are no longer for sale to the public. The Contract was sold by both registered representatives of MML Investors Services, LLC (MMLIS), a subsidiary of MassMutual, and by registered representatives of other broker-dealers who have entered into distribution agreements with MML Strategic Distributors, LLC (MSD), a subsidiary of MassMutual. Pursuant to separate underwriting agreements with MassMutual, on its own behalf and on behalf of the Separate Account, MMLIS serves as principal underwriter of the Contracts sold by its registered representatives, and MSD serves as principal underwriter of the Contracts sold by registered representatives of other broker-dealers who have entered into distribution agreements with MSD.

MMLIS and MSD are registered with the SEC as broker-dealers under the Securities Exchange Act of 1934 and are members of the Financial Industry Regulatory Authority (FINRA). MMLIS and MSD also receive compensation for their actions as principal underwriters of the Contracts.

Commissions and Allowances Paid

Commissions for sales of the Contract by MMLIS registered representatives are paid on behalf of MMLIS by MassMutual to MMLIS registered representatives. Commissions for sales of the Contract by registered representatives of other broker-dealers are paid on behalf of MSD by MassMutual to those broker-dealers. We also pay expense allowances in connection with the sales of the Contracts. The maximum commission payable for the Contract is 8.63% of Purchase Payments made to a Contract and/or up to 2.4% of Contract Value annually.

Additional Compensation Paid to MMLIS

Most MMLIS registered representatives are also MassMutual insurance agents, and as such, are eligible for certain cash and non-cash benefits from MassMutual. Cash compensation includes bonuses and allowances based on factors such as sales, productivity and persistency. Non-cash compensation includes various recognition items such as prizes and awards as well as attendance at, and payment of the costs associated with attendance at, conferences, seminars and recognition trips, and also includes contributions to certain individual plans such as pension and medical plans. Sales of the Contract may help these registered representatives and their supervisors qualify for such benefits. MMLIS registered representatives who are also general agents or sales managers of MassMutual also may receive overrides, allowances and other compensation that is based on sales of the Contract by their registered representatives.

Additional Compensation Paid to Certain Broker-Dealers

We and MSD make additional commission payments to certain broker-dealers in the form of asset-based payments and sales-based payments. We also make cash payments and non-cash payments to certain broker-dealers. The asset-based and sales-based payments are made to participate in those broker-dealers' preferred provider programs or marketing support programs, or to otherwise promote the Contract. Asset-based payments are based on the value of the assets in the MassMutual contracts sold by that broker-dealer. Sales-based payments are paid on each sale of the Contract and each subsequent Purchase Payment applied to the Contract. Cash payments are made to attend sales conferences and educational seminars sponsored by certain broker-dealers. Non-cash payments include various promotional items. For a list of the broker-dealers to whom we currently pay additional compensation for selling the Contract, visit www.MassMutual.com/legal/compensation-arrangements or call our Service Center.

The additional compensation arrangements described in the preceding paragraphs are not offered to all broker-dealers and the terms of such arrangements may differ among broker-dealers. Some broker-dealers may receive two or more of these payments. Such payments may give us greater access to the registered representatives of the broker-dealers that receive such compensation or may influence the way that a broker-dealer markets the Contract. Any such compensation will be paid by MSD or us and will not result in any additional direct charge to you.

Compensation in General

The compensation arrangements described above may provide a registered representative with an incentive to sell the Contract over other available contracts whose issuers do not provide such compensation. You may want to take these compensation arrangements into account when evaluating any recommendation regarding the Contract.

We intend to recoup a portion of the cash and non-cash compensation payments that we make through the assessment of certain charges described in this prospectus, including the CDSC. We may also use some of the 12b-1 distribution fee payments and other payments that we receive from certain Funds to help us make these cash and non-cash payments.

You may want to contact MMLIS or your registered representative to find out more about the compensation they receive in connection with your purchase of a Contract.

Commissions or overrides may also be paid to broker-dealers providing wholesaling services (such as providing sales support and training for sales representatives who sell the Contracts).

Other Information

Collateral Assignment

In certain states, you cannot assign the Contract without our approval. We will refuse or accept any request to assign the Contract on a non-discriminatory basis. Please refer to your Contract.

We must receive a Written Request from you, in Good Order, for any assignment we allow to be binding on us. We will not be liable for any payment or other action we take in accordance with the Contract before we receive notice of the assignment. We are not responsible for the validity of an assignment. You may be subject to tax consequences if you assign your Contract.

If the Contract is issued pursuant to a qualified plan, there may be limitations on your ability to assign the Contract. If you assign your Contract, your rights may only be exercised with the consent of the assignee of record.

Unclaimed Property

Every state has some form of unclaimed property law that imposes varying legal and practical obligations on insurers and, indirectly, on Owners, Beneficiaries, and any other payees of proceeds from a Contract.

Unclaimed property laws generally provide for the transfer of benefits or payments under various circumstances to the abandoned property division or unclaimed property office in the state of last residence. This process is known as escheatment. To help avoid escheatment, keep your own information, as well as Beneficiary and any other payee information up-to-date, including: full names, postal and electronic media addresses, telephone numbers, dates of birth, and social security numbers. To update this information, contact our Service Center. IRS guidance requires us to withhold federal income tax from escheated payments from certain qualified contracts, and to report such payments to the IRS on Form 1099-R.

Anti-Money Laundering

Federal laws designed to counter terrorism and prevent money laundering might, in certain circumstances, require us to reject a Purchase Payment or block an Owner's ability to make certain transactions and thereby refuse to accept any request for transfers, withdrawals, or death benefits, until instructions are received from the appropriate regulator. We may also be required to provide additional information about you and your Contract to government regulators.

Payments We Make

We may be required to suspend or postpone payments for withdrawals or transfers from the Sub-Accounts for any period when:

- the NYSE is closed (other than customary weekend and holiday closings);
- trading on the NYSE is restricted;
- an emergency exists as a result of which disposal of shares of the Funds is not reasonably practicable or we cannot reasonably value the shares of the Funds; or
- during any other period when the SEC, by order, so permits for your protection.

We reserve the right to defer payment for a withdrawal from The Fixed Accounts for the period permitted by law, but not for more than six months.

In addition, if, pursuant to the SEC's rules, a money market fund suspends payment of redemption proceeds in connection with a liquidation of that Fund, we will delay payment of any transfer, withdrawal or death benefit from the applicable money market Sub-Account until the Fund is liquidated.

Federal laws designed to counter terrorism and prevent money laundering might, in certain circumstances, require us to reject a Purchase Payment or block an Owner's ability to make certain transactions and thereby refuse to accept any request for transfers, withdrawals, or death benefits, until instructions are received from the appropriate regulator. We may also be required to provide additional information about you and your Contract to government regulators.

Changes to the Contract

We reserve the right to amend the Contract to meet the requirements of applicable federal or state laws or regulations, or as otherwise provided in the Contract. We will notify you by Written Notice of such amendments.

Special Arrangements

For certain group or sponsored arrangements there may be expense savings that can be passed on to the customer because our cost for sales, administration, and mortality generally vary with the size of the customer. We will consider factors such as the size of the group, the nature of the sale, the expected Purchase Payment volume, and other factors we consider significant in determining whether to reduce charges. Subject to applicable state laws and regulations, we reserve the right to reduce or waive the administrative charge, the annual contract maintenance charge or any other charge that is appropriate to reflect any expense savings. We will make any reductions according to our rules in effect when an application for a Contract is approved. We may change these rules from time to time. Any reduction in charges will reflect differences in costs or services, and will not be unfairly discriminatory.

We reserve the right to modify or terminate such arrangements.

Termination of the Contract

We will terminate your Contract upon the occurrence of any of the following events:

- the date of the last Annuity Payment if you have applied your entire Contract Value to an Annuity Option;
- the date withdrawal is made of the entire Contract Value when there are no Annuity Payments remaining;
- the date of the last payment upon death to the last Beneficiary; or
- the date your Contract is returned under the right to examine Contract provision.

In addition, in most states we reserve the right to terminate your Contract if no Purchase Payment has been made for at least two consecutive years (three consecutive years in New York) measured from the date we received the last Purchase Payment; and each of the following amounts is less than \$2,000 on the date we send notice of our election to terminate your Contract:

- your Contract Value less any Premium Tax deducted;
- your Contract withdrawal value; and
- the sum of all Purchase Payments made into your Contract adjusted for any partial withdrawals.

Computer System, Cybersecurity, and Service Disruption Risks

The Company and its business partners rely on computer systems to conduct business, including customer service, marketing and sales activities, customer relationship management and producing financial statements. While the Company and its business partners have policies, procedures, automation and backup plans designed to prevent or limit the effect of failures, our respective computer systems may be vulnerable to disruptions or breaches as the result of natural disasters, man-made disasters, criminal activity, pandemics, or other events beyond our control. The failure of our or our business partners' computer systems for any reason could disrupt operations, result in the loss of customer business and adversely impact profitability.

The Company and its business partners retain confidential information on our respective computer systems, including customer information and proprietary business information. Any compromise of the security of our or our business partners' computer systems that results in the disclosure of personally identifiable customer information could damage our reputation, expose us to litigation, increase regulatory scrutiny and require us to incur significant technical, legal, and other expenses. The risk of cyber-attacks may be higher during periods of geopolitical turmoil (such as the Russian invasion of Ukraine and the responses by the United States and other governments).

Geopolitical and other events, including natural disasters, war, terrorism, economic uncertainty, trade disputes, public health crises and related geopolitical events, and widespread disease, including pandemics (such as COVID-19) and epidemics, have led, and in the future may lead, to increased market volatility, which may disrupt U.S. and world economies and markets and may have significant adverse direct or indirect effects on the Company. These events may adversely affect computer and other systems on which the Company relies, interfere with the processing of Contract-related transactions (including the processing of orders from owners and orders with the funds) and the Company's ability to administer this Contract in a timely manner, or have other possible negative effects. These events may also impact the issuers of securities in which the funds invest, which may cause the funds underlying the Contract to lose value. There can be no assurance that we, the funds or our service providers will avoid losses affecting the Contract due to these geopolitical and other events. If we are unable to receive U.S. mail or fax transmissions due to a closure of U.S. mail delivery by the government or due to the need to protect the health of our employees, you may still be able to submit transaction requests to the Company electronically or over the telephone. Our inability to receive U.S. mail or fax transmissions may cause delays in the pricing and processing of transaction requests submitted to us by U.S. mail or by fax during that time period.

Legal Proceedings

The Company is subject to legal and regulatory actions, including class action lawsuits, in the ordinary course of its business. Our pending legal and regulatory actions include proceedings specific to us, as well as proceedings generally applicable to business practices in the industry in which we operate. From time to time, we also are subject to governmental and administrative proceedings and regulatory inquiries, examinations, and investigations in the ordinary course of our business. In addition, we, along with other industry participants, may occasionally be subject to investigations, examinations, and inquiries (in some cases industry-wide) concerning issues upon which regulators have decided to focus. Some of these proceedings involve requests for substantial and/or unspecified amounts, including compensatory or punitive damages.

While it is not possible to predict with certainty the ultimate outcome of any pending litigation proceedings or regulatory action, management believes, based on information currently known to it, that the ultimate outcome of all pending litigation and regulatory matters, after consideration of applicable reserves and rights to indemnification, is not likely to have a material adverse effect upon the Separate Account, the ability of the principal underwriter(s) to perform in accordance with its contracts with the Company on behalf of the Separate Account, or the ability of the Company to meet its obligations under the Contract.

For more information regarding the Company's litigation and other legal proceedings, see the notes to the Company's financial statements contained within the SAI.

Our Financial Statements

The financial statements for the Separate Account and the Company are included in the SAI. Our financial statements should be distinguished from the financial statements of the Separate Account, and you should consider our financial statements as bearing only upon our ability to meet our obligations under the Contracts. Contact us at our Service Center for a free copy of these financial statements and the SAI.

Appendix A

Funds Available Under the Contract

The following is a list of Funds currently available under the Contract. The list of Funds is subject to change, as discussed in the prospectus for the Contract. Depending on the optional benefits you choose, you may not be able to invest in certain Funds. See “Appendix B – Funds Available Under the Benefits Offered Under the Contract” for information regarding the allocation restrictions associated with participation in MassMutual Lifetime Income Protector, Guaranteed Minimum Accumulation Benefit (GMAB), Guaranteed Minimum Income Benefit (GMIB), or MassMutual Lifetime Payment Plus. Before you invest, you should review the prospectuses for the Funds. These prospectuses contain more information about the Funds and their risks and may be amended from time to time. You can find the prospectuses and other information about the Funds online at www.MassMutual.com/MMTransitionsSelect. You can also request this information at no cost by calling (800) 272-2216 or sending an email request to ANNfax@MassMutual.com.

The current expenses and performance information below reflects fees and expenses of the Funds, but does not reflect the other fees and expenses that your Contract may charge. Expenses would be higher and performance would be lower if these charges were included. Each Fund's past performance is not necessarily an indication of future performance.

Pre-2008 Version (for Contracts applied for prior to 9/8/2008 or in states where the 2008 Version was unavailable)

Fund Type	Fund and Adviser/Sub-Adviser	Current Expenses (expenses/average assets)	Average Annual Total Returns (as of 12/31/2023)		
			1 Year	5 Year	10 Year
Asset Allocation	MML Aggressive Allocation Fund (Initial Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	0.97%	18.32%	10.27%	7.32%
Asset Allocation	MML American Funds Core Allocation Fund (Service Class I) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	1.00%	14.37%	7.94%	6.44%
Asset Allocation	MML Balanced Allocation Fund (Initial Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	0.85%	12.47%	6.44%	4.95%
Asset Allocation	MML Conservative Allocation Fund (Initial Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	0.82%	11.65%	5.54%	4.37%
Asset Allocation	MML Growth Allocation Fund (Initial Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	0.90%	15.98%	8.95%	6.48%
Asset Allocation	MML Moderate Allocation Fund (Initial Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	0.86%	13.90%	7.29%	5.50%
Money Market	Invesco V.I. U.S. Government Money Portfolio (Series I) ⁽²⁾⁽³⁾ Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.63%	4.54%	1.54%	0.94%
Money Market	MML U.S. Government Money Market Fund (Initial Class) ⁽²⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: Barings LLC	0.52%	4.64%	1.54%	0.95%
Fixed Income	Invesco V.I. Global Strategic Income Fund (Series I) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.92% ^(*)	8.88%	1.30%	1.50%

Fund Type	Fund and Adviser/Sub-Adviser	Current Expenses (expenses/average assets)	Average Annual Total Returns (as of 12/31/2023)		
			1 Year	5 Year	10 Year
Fixed Income	MML High Yield Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Barings LLC	1.21% ^(*)	12.82%	4.78%	4.26%
Fixed Income	MML Inflation-Protected and Income Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Barings LLC	0.61% ^(*)	5.43%	3.19%	2.48%
Fixed Income	MML Managed Bond Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Barings LLC	0.45%	6.70%	1.58%	2.04%
Fixed Income	MML Short-Duration Bond Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Barings LLC	0.83%	6.70%	1.06%	1.32%
Fixed Income	MML Total Return Bond Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Metropolitan West Asset Management, LLC	0.88%	5.20%	0.79%	1.29%
Balanced	Invesco V.I. Equity and Income Fund (Series I) ⁽⁴⁾⁽⁵⁾⁽⁶⁾ Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.57%	10.56%	9.93%	7.06%
Balanced	MML Blend Fund (Initial Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: BlackRock Investment Management, LLC	0.50%	17.62%	9.10%	7.55%
Large Cap Value	MML Equity Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Brandywine Global Investment Management, LLC	0.44%	9.32%	11.99%	8.34%
Large Cap Value	MML Equity Income Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: T. Rowe Price Associates, Inc.	0.79%	9.54%	11.20%	7.86%
Large Cap Value	MML Fundamental Value Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Boston Partners Global Investors, Inc.	1.05%	13.41%	11.86%	8.13%
Large Cap Value	MML Income & Growth Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Barrow, Hanley, Mewhinney & Strauss, LLC	0.71%	9.19%	12.00%	8.79%
Large Cap Blend	Fidelity® VIP Contrafund® Portfolio (Initial Class) Adviser: Fidelity Management & Research Company LLC Sub-Advisers: FMR Investment Management (UK) Limited, Fidelity Management & Research (Hong Kong) Limited, and Fidelity Management & Research (Japan) Limited	0.56%	33.45%	16.65%	11.61%
Large Cap Blend	Invesco V.I. Diversified Dividend Fund (Series I) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.68%	9.04%	9.81%	7.80%
Large Cap Blend	Invesco V.I. Main Street Fund® (Series I) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.80% ^(*)	23.22%	13.57%	10.02%
Large Cap Blend	MML Equity Index Fund (Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Northern Trust Investments, Inc.	0.43%	25.75%	15.21%	11.57%

Fund Type	Fund and Adviser/Sub-Adviser	Current Expenses (expenses/average assets)	Average Annual Total Returns (as of 12/31/2023)		
			1 Year	5 Year	10 Year
Large Cap Blend	MML Focused Equity Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Wellington Management Company LLP	1.12%	9.69%	13.14%	10.55%
Large Cap Blend	MML Fundamental Equity Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Invesco Advisers, Inc.	1.06%	22.76%	14.68%	11.94%
Large Cap Blend	MML Sustainable Equity Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: American Century Investment Management, Inc.	0.56%	24.51%	14.72%	10.97%
Large Cap Growth	Invesco V.I. Capital Appreciation Fund (Series I) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.80% ^(*)	35.38%	16.40%	11.56%
Large Cap Growth	MML American Funds Growth Fund (Service Class I) ⁽⁷⁾⁽⁸⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	1.02%	37.96%	18.17%	13.87%
Large Cap Growth	MML Blue Chip Growth Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: T. Rowe Price Associates, Inc.	0.78%	49.53%	12.93%	12.05%
Large Cap Growth	MML Large Cap Growth Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Loomis, Sayles & Company, L.P.	0.69%	51.71%	17.75%	12.98%
Small/Mid-Cap Value	MML Mid Cap Value Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: American Century Investment Management, Inc.	0.89%	5.97%	11.11%	8.83%
Small/Mid-Cap Value	MML Small Company Value Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: American Century Investment Management, Inc.	1.24% ^(*)	15.92%	10.94%	7.35%
Small/Mid-Cap Value	MML Small/Mid Cap Value Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: AllianceBernstein L.P.	0.82%	17.12%	11.06%	7.75%
Small/Mid-Cap Blend	MML Small Cap Equity Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Invesco Advisers, Inc.	0.73%	17.81%	13.18%	9.09%
Small/Mid-Cap Growth	Invesco V.I. Discovery Mid Cap Growth Fund (Series I) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.87%	13.15%	12.77%	9.79%
Small/Mid-Cap Growth	MML Mid Cap Growth Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Advisers: T. Rowe Price Associates, Inc. and Wellington Management Company LLP	0.82%	22.64%	11.38%	10.40%
Small/Mid-Cap Growth	MML Small Cap Growth Equity Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Wellington Management Company LLP	1.08% ^(*)	16.84%	11.91%	8.80%
International/Global	Invesco Oppenheimer V.I. International Growth Fund (Series I) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	1.00% ^(*)	21.06%	8.72%	3.80%

Fund Type	Fund and Adviser/Sub-Adviser	Current Expenses (expenses/average assets)	Average Annual Total Returns (as of 12/31/2023)		
			1 Year	5 Year	10 Year
International/Global	Invesco V.I. Global Fund (Series I) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.82%	34.73%	12.30%	8.47%
International/Global	MML Foreign Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Thompson, Siegel and Walmsley LLC	0.95%	16.22%	6.11%	2.22%
International/Global	MML Global Fund (Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Massachusetts Financial Services Company	0.83%	14.51%	10.46%	7.38%
International/Global	MML International Equity Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Advisers: Massachusetts Financial Services Company and Harris Associates L.P.	1.20% ^(*)	18.27%	7.84%	—
International/Global	MML Strategic Emerging Markets Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Invesco Advisers, Inc.	1.50% ^(*)	10.40%	1.68%	0.87%
Specialty ⁽⁹⁾	Invesco V.I. Health Care Fund (Series I) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.98%	3.02%	8.75%	6.87%
Specialty ⁽⁹⁾	Invesco V.I. Technology Fund (Series I) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.98%	46.94%	14.92%	12.24%
Specialty ⁽⁹⁾	Macquarie VIP Asset Strategy Series (Service Class) ⁽¹⁰⁾ Adviser: Delaware Management Company Sub-Advisers: Macquarie Investment Management Austria Kapitalanlage AG, Macquarie Investment Management Europe Limited, and Macquarie Investment Management Global Limited	0.85% ^(*)	13.94%	8.27%	3.48%
Specialty ⁽⁹⁾	MML Managed Volatility Fund (Initial Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Gateway Investment Advisers, LLC	1.06%	12.87%	5.74%	4.36%
Specialty ⁽⁹⁾	PIMCO CommodityRealReturn® Strategy Portfolio (Advisor Class) Adviser: Pacific Investment Management Company LLC Sub-Adviser: N/A	1.58% ^(*)	-7.93%	8.46%	-0.90%
Specialty ⁽⁹⁾	VY® CBRE Global Real Estate Portfolio (Class S) Adviser: Voya Investments, LLC Sub-Adviser: CBRE Clarion Securities LLC	1.15% ^(*)	12.33%	5.90%	4.23%

(*) These Funds and their investment advisers have entered into contractual fee waivers or expense reimbursements. These temporary fee reductions are reflected in their current expenses. Those contractual arrangements are designed to reduce the Fund's total current expenses for Owners and will continue past the current year.

- (1) These are fund-of-funds investment choices. They are known as fund-of-funds because they invest in other underlying funds. A fund offered in a fund-of-funds structure may have higher expenses than a direct investment in its underlying funds because a fund-of-funds bears its own expenses and indirectly bears its proportionate share of expenses of the underlying funds in which it invests.
- (2) You could lose money by investing in the Fund. Although the Fund seeks to preserve the value of your investment at \$1.00 per share, it cannot guarantee it will do so. An investment in the Fund is not insured or guaranteed by the Federal Deposit Insurance Corporation or any other government agency. The Fund's sponsor has no legal obligation to provide financial support to the Fund, and you should not expect that the sponsor will provide financial support to the Fund at any time. The yield of this Fund may become very low during periods of low interest rates. After deduction of Separate Account charges, the yield in the division that invests in this Fund could be negative.
- (3) Unavailable in Contracts issued on or after January 19, 2008.
- (4) Invesco V.I. Equity and Income Fund was added as an investment option on April 29, 2024.
- (5) Invesco V.I. Conservative Balanced Fund merged into Invesco V.I. Equity and Income Fund after the close of the New York Stock Exchange on April 26, 2024.

- (6) Unavailable in Contracts issued on or after May 1, 2009. For Contracts issued prior to May 1, 2009, you may not allocate any new money to this Fund via Purchase Payments or transfers.
- (7) The Fund is a “feeder” fund, meaning that it does not buy investment securities directly, but instead invests in shares of a corresponding “master” fund, which in turn purchases investment securities. A fund offered in a master feeder structure may have higher expenses than those of a fund which invests directly in securities because the “feeder” fund bears its own expenses in addition to those of the “master” fund. You should read the Fund prospectuses for more information about this “feeder” fund.
- (8) The MML American Funds Growth Fund invests all of its assets in the Class 1 shares of the American Funds Insurance Series® – Growth Fund. However, this Fund is not available directly as investment choices under your MassMutual variable product. You should read the prospectus along with the prospectus for the MML American Funds Growth Fund.
- (9) Specialty funds are an all-encompassing category that consists of funds that forgo broad diversification to concentrate on a certain segment of the economy or a specific targeted strategy. For example, sector funds are targeted strategy funds aimed at specific sectors of the economy, such as financial, technology, healthcare, and so on. Sector funds can, therefore, be more volatile than a more diversified equity fund since the stocks in a given sector tend to be highly correlated with each other.
- (10) Macquarie VIP Asset Strategy Series formerly known as Delaware Ivy VIP Asset Strategy.

2008 Version (for Contracts applied for on or after 9/8/2008, subject to state availability)

Fund Type	Fund and Adviser/Sub-Adviser	Current Expenses (expenses/average assets)	Average Annual Total Returns (as of 12/31/2023)		
			1 Year	5 Year	10 Year
Asset Allocation	MML Aggressive Allocation Fund (Service Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	1.22%	17.97%	10.00%	7.05%
Asset Allocation	MML American Funds Core Allocation Fund (Service Class I) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	1.00%	14.37%	7.94%	6.44%
Asset Allocation	MML Balanced Allocation Fund (Service Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	1.10%	12.26%	6.20%	4.69%
Asset Allocation	MML Conservative Allocation Fund (Service Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	1.07%	11.32%	5.28%	4.11%
Asset Allocation	MML Growth Allocation Fund (Service Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	1.15%	15.83%	8.70%	6.23%
Asset Allocation	MML Moderate Allocation Fund (Service Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	1.11%	13.62%	7.02%	5.24%
Money Market	MML U.S. Government Money Market Fund (Initial Class) ⁽²⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: Barings LLC	0.52%	4.64%	1.54%	0.95%
Fixed Income	Invesco V.I. Global Strategic Income Fund (Series II) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	1.17% ^(*)	8.60%	1.04%	1.25%
Fixed Income	MML High Yield Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Barings LLC	1.21% ^(*)	12.82%	4.78%	4.26%
Fixed Income	MML Inflation-Protected and Income Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Barings LLC	0.86% ^(*)	5.05%	2.91%	2.22%
Fixed Income	MML Managed Bond Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Barings LLC	0.70%	6.43%	1.32%	1.78%

Fund Type	Fund and Adviser/Sub-Adviser	Current Expenses (expenses/average assets)	Average Annual Total Returns (as of 12/31/2023)		
			1 Year	5 Year	10 Year
Fixed Income	MML Short-Duration Bond Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Barings LLC	0.83%	6.70%	1.06%	1.32%
Fixed Income	MML Total Return Bond Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Metropolitan West Asset Management, LLC	0.88%	5.20%	0.79%	1.29%
Balanced	Invesco V.I. Equity and Income Fund (Series II) ⁽³⁾⁽⁴⁾⁽⁵⁾ Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.82%	10.24%	6.38%	9.64%
Balanced	MML Blend Fund (Service Class) ⁽¹⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: BlackRock Investment Management, LLC	0.75%	17.32%	8.83%	7.29%
Large Cap Value	MML Equity Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Brandywine Global Investment Management, LLC	0.69%	9.05%	11.71%	8.07%
Large Cap Value	MML Equity Income Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: T. Rowe Price Associates, Inc.	1.04%	9.28%	10.92%	7.58%
Large Cap Value	MML Fundamental Value Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Boston Partners Global Investors, Inc.	1.05%	13.41%	11.86%	8.13%
Large Cap Value	MML Income & Growth Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Barrow, Hanley, Mewhinney & Strauss, LLC	0.96%	8.98%	11.73%	8.52%
Large Cap Blend	Fidelity® VIP Contrafund® Portfolio (Service Class 2) Adviser: Fidelity Management & Research Company LLC Sub-Advisers: FMR Investment Management (UK) Limited, Fidelity Management & Research (Hong Kong) Limited, and Fidelity Management & Research (Japan) Limited	0.81%	33.12%	16.36%	11.33%
Large Cap Blend	Invesco V.I. Diversified Dividend Fund (Series II) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	0.93%	8.77%	9.53%	7.53%
Large Cap Blend	Invesco V.I. Main Street Fund® (Series II) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	1.05% ^(*)	22.83%	13.28%	9.74%
Large Cap Blend	MML Equity Index Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Northern Trust Investments, Inc.	0.68%	25.44%	14.92%	11.29%
Large Cap Blend	MML Focused Equity Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Wellington Management Company LLP	1.12%	9.69%	13.14%	10.55%
Large Cap Blend	MML Fundamental Equity Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Invesco Advisers, Inc.	1.06%	22.76%	14.68%	11.94%
Large Cap Blend	MML Sustainable Equity Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: American Century Investment Management, Inc.	0.81%	24.20%	14.44%	10.69%

Fund Type	Fund and Adviser/Sub-Adviser	Current Expenses (expenses/average assets)	Average Annual Total Returns (as of 12/31/2023)		
			1 Year	5 Year	10 Year
Large Cap Growth	Invesco V.I. Capital Appreciation Fund (Series II) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	1.05% ^(*)	35.03%	16.10%	11.28%
Large Cap Growth	MML American Funds Growth Fund (Service Class I) ⁽⁶⁾⁽⁷⁾ Adviser: MML Investment Advisers, LLC Sub-Adviser: N/A	1.02%	37.96%	18.17%	13.87%
Large Cap Growth	MML Blue Chip Growth Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: T. Rowe Price Associates, Inc.	1.03%	49.09%	12.64%	11.76%
Large Cap Growth	MML Large Cap Growth Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Loomis, Sayles & Company, L.P.	0.94%	51.37%	17.47%	12.70%
Small/Mid-Cap Value	MML Mid Cap Value Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: American Century Investment Management, Inc.	1.14%	5.70%	10.84%	8.56%
Small/Mid-Cap Value	MML Small Company Value Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: American Century Investment Management, Inc.	1.24% ^(*)	15.92%	10.94%	7.35%
Small/Mid-Cap Value	MML Small/Mid Cap Value Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: AllianceBernstein L.P.	1.07%	16.89%	10.79%	7.48%
Small/Mid-Cap Blend	MML Small Cap Equity Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Invesco Advisers, Inc.	0.98%	17.52%	12.89%	8.81%
Small/Mid-Cap Growth	Invesco V.I. Discovery Mid Cap Growth Fund (Series II) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	1.12%	12.85%	12.47%	9.51%
Small/Mid-Cap Growth	MML Mid Cap Growth Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Advisers: T. Rowe Price Associates, Inc. and Wellington Management Company LLP	1.07%	22.34%	11.12%	10.13%
Small/Mid-Cap Growth	MML Small Cap Growth Equity Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Wellington Management Company LLP	1.33% ^(*)	16.55%	11.63%	8.53%
International/Global	Invesco Oppenheimer V.I. International Growth Fund (Series II) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	1.25% ^(*)	20.64%	8.43%	3.57%
International/Global	Invesco V.I. Global Fund (Series II) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	1.07%	34.45%	12.02%	8.20%
International/Global	MML Foreign Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Thompson, Siegel and Walmsley LLC	1.20%	15.97%	5.83%	1.97%
International/Global	MML Global Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Massachusetts Financial Services Company	1.08%	14.08%	10.18%	7.09%

Fund Type	Fund and Adviser/Sub-Adviser	Current Expenses (expenses/average assets)	Average Annual Total Returns (as of 12/31/2023)		
			1 Year	5 Year	10 Year
International/Global	MML International Equity Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Advisers: Massachusetts Financial Services Company and Harris Associates L.P.	1.20% ^(*)	18.27%	7.84%	—
International/Global	MML Strategic Emerging Markets Fund (Service Class I) Adviser: MML Investment Advisers, LLC Sub-Adviser: Invesco Advisers, Inc.	1.50% ^(*)	10.40%	1.68%	0.87%
Specialty ⁽⁸⁾	Invesco V.I. Health Care Fund (Series II) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	1.23%	2.77%	8.49%	6.60%
Specialty ⁽⁸⁾	Invesco V.I. Technology Fund (Series II) Adviser: Invesco Advisers, Inc. Sub-Adviser: N/A	1.23%	46.72%	14.65%	11.97%
Specialty ⁽⁸⁾	Macquarie VIP Asset Strategy Series (Service Class) ⁽⁹⁾ Adviser: Delaware Management Company Sub-Advisers: Macquarie Investment Management Austria Kapitalanlage AG, Macquarie Investment Management Europe Limited, and Macquarie Investment Management Global Limited	0.85% ^(*)	13.94%	8.27%	3.48%
Specialty ⁽⁸⁾	MML Managed Volatility Fund (Service Class) Adviser: MML Investment Advisers, LLC Sub-Adviser: Gateway Investment Advisers, LLC	1.31%	12.59%	5.47%	4.10%
Specialty ⁽⁸⁾	PIMCO CommodityRealReturn® Strategy Portfolio (Advisor Class) Adviser: Pacific Investment Management Company LLC Sub-Adviser: N/A	1.58% ^(*)	−7.93%	8.46%	−0.90%
Specialty ⁽⁸⁾	VY® CBRE Global Real Estate Portfolio (Class S) Adviser: Voya Investments, LLC Sub-Adviser: CBRE Clarion Securities LLC	1.15% ^(*)	12.33%	5.90%	4.23%

(*) These Funds and their investment advisers have entered into contractual fee waivers or expense reimbursements. These temporary fee reductions are reflected in their current expenses. Those contractual arrangements are designed to reduce the Fund's total current expenses for Owners and will continue past the current year.

- (1) These are fund-of-funds investment choices. They are known as fund-of-funds because they invest in other underlying funds. A fund offered in a fund-of-funds structure may have higher expenses than a direct investment in its underlying funds because a fund-of-funds bears its own expenses and indirectly bears its proportionate share of expenses of the underlying funds in which it invests.
- (2) You could lose money by investing in the Fund. Although the Fund seeks to preserve the value of your investment at \$1.00 per share, it cannot guarantee it will do so. An investment in the Fund is not insured or guaranteed by the Federal Deposit Insurance Corporation or any other government agency. The Fund's sponsor has no legal obligation to provide financial support to the Fund, and you should not expect that the sponsor will provide financial support to the Fund at any time. The yield of this Fund may become very low during periods of low interest rates. After deduction of Separate Account charges, the yield in the division that invests in this Fund could be negative.
- (3) Invesco V.I. Equity and Income Fund was added as an investment option on April 29, 2024.
- (4) Invesco V.I. Conservative Balanced Fund merged into Invesco V.I. Equity and Income Fund after the close of the New York Stock Exchange on April 26, 2024.
- (5) Unavailable in Contracts issued on or after May 1, 2009. For Contracts issued prior to May 1, 2009, you may not allocate any new money to this Fund via Purchase Payments or transfers.
- (6) The Fund is a "feeder" fund, meaning that it does not buy investment securities directly, but instead invests in shares of a corresponding "master" fund, which in turn purchases investment securities. A fund offered in a master feeder structure may have higher expenses than those of a fund which invests directly in securities because the "feeder" fund bears its own expenses in addition to those of the "master" fund. You should read the Fund prospectuses for more information about this "feeder" fund.
- (7) The MML American Funds Growth Fund invests all of its assets in the Class 1 shares of the American Funds Insurance Series® – Growth Fund. However, this Fund is not available directly as investment choices under your MassMutual variable product. You should read the prospectus along with the prospectus for the MML American Funds Growth Fund.
- (8) Specialty funds are an all-encompassing category that consists of funds that forgo broad diversification to concentrate on a certain segment of the economy or a specific targeted strategy. For example, sector funds are targeted strategy funds aimed at specific sectors of the economy, such as financial, technology, healthcare,

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and so on. Sector funds can, therefore, be more volatile than a more diversified equity fund since the stocks in a given sector tend to be highly correlated with each other.

(9) Macquarie VIP Asset Strategy Series formerly known as Delaware Ivy VIP Asset Strategy.

Appendix B

Funds Available Under the Benefits Offered Under the Contract

You must elect an Asset Allocation Program if you are participating in: MassMutual Lifetime Income Protector; Guaranteed Minimum Accumulation Benefit (GMAB); Guaranteed Minimum Income Benefit (GMIB); or MassMutual Lifetime Payment Plus. These Asset Allocation Programs have investment restrictions, which are described in the tables below.

Custom Allocation Choice Select

For Contracts issued on or after May 1, 2010 with MassMutual Lifetime Income Protector or GMAB in effect. If you participate in Custom Allocation Choice Select, you must allocate your Purchase Payments within the minimum and maximum range listed for the Sub-Accounts below. **You may only elect Custom Allocation Choice Select if you are participating in MassMutual Lifetime Income Protector or in the Guaranteed Minimum Accumulation Benefit (see “Transfers and Transfer Programs – Transfers During the Income Phase – Asset Allocation Programs”).**

Range	Sub-Accounts
40% to 60%	MML Managed Bond
20% to 25% (total)	MML Equity MML Equity Income MML Managed Volatility
20% to 25% (total)	MML American Funds Growth MML Equity Index
0% to 10% (total)	MML Mid Cap Growth MML Mid Cap Value
0% to 10% (total)	Invesco V.I. Global MML Global

Custom Allocation Choice

For Contracts applied for on or after May 1, 2009 and issued prior to May 1, 2010 with GMAB, GMIB, or MassMutual Lifetime Payment Plus in effect. If you participate in Custom Allocation Choice you must allocate your Purchase Payments within the minimum and maximum range listed for the Sub-Accounts below. No allocation greater than 25% is allowed in any one Sub-Account.

Range	Sub-Accounts
35% to 65% with GMAB ⁽¹⁾ (total)	Invesco V.I. Global Strategic Income
0% to 65% without GMAB ⁽¹⁾ (total)	MML Inflation-Protected & Income
	MML Managed Bond
	MML U.S. Government Money Market
15% to 25% (total)	MML Blend
	MML Equity
	MML Equity Income
	MML Income & Growth
	MML Managed Volatility
15% to 25% (total)	Fidelity® VIP Contrafund®
	Invesco V.I. Capital Appreciation
	Invesco V.I. Main Street
	MML American Funds Growth
	MML Blue Chip Growth
	MML Equity Index
	MML Sustainable Equity
	MML Large Cap Growth
0% to 10% (total)	MML Mid Cap Value
	MML Small/Mid Cap Value
	MML Small Company Value
0% to 10% (total)	Invesco V.I. Discovery Mid Cap Growth
	MML Mid Cap Growth
	MML Small Cap Equity
	MML Small Cap Growth Equity
5% to 20% (total)	Invesco V.I. Global
	Invesco Oppenheimer V.I. International Growth
	MML Foreign
	MML Global
0% to 5% (total)	Invesco V.I. Health Care
	Invesco V.I. Technology
	MML Strategic Emerging Markets
	PIMCO CommodityRealReturn® Strategy
0% to 5% (total)	Invesco V.I. Diversified Dividend
	VY® CBRE Global Real Estate Fund

(1) Guaranteed Minimum Accumulation Benefit

If you applied for your Contract before May 1, 2009, contact our Service Center or your registered representative for details about ranges, asset classes and investment choices.

Custom Allocation Choice is unavailable to Contracts issued on or after May 1, 2010 (see “Transfers and Transfer Programs – Transfers During the Income Phase – Asset Allocation Programs”).

Asset Allocation Funds

If you are participating in MassMutual Lifetime Income Protector, GMAB, GMIB or MassMutual Lifetime Payment Plus, you can fulfill our requirement that you participate in an Asset Allocation Program, by allocating all of your Contract Value to one of our Asset Allocation Funds. While participating in this program you can make transfers by moving your full Contract Value from one Asset Allocation Fund to another.

The Funds are as follows:

- MML Aggressive Allocation Fund⁽¹⁾
- MML American Funds Core Allocation Fund
- MML Balanced Allocation Fund
- MML Conservative Allocation Fund
- MML Growth Allocation Fund⁽²⁾
- MML Moderate Allocation Fund

These Funds are also available if you do not have an election of MassMutual Lifetime Income Protector, a GMAB, GMIB or MassMutual Lifetime Payment Plus. In such case you may allocate a portion or all of your Contract Value to these Funds.

(1) The MML Aggressive Allocation Fund is not available as an investment choice if you are participating in MassMutual Lifetime Income Protector, MassMutual Guaranteed Income Plus 6 or MassMutual Lifetime Payment Plus. Additionally, this Fund is unavailable if your Contract was issued on or after 4/15/2009 and you are participating in MassMutual Guaranteed Income Plus 5 or the Guaranteed Minimum Accumulation Benefit.

(2) The MML Growth Allocation Fund is not available as an investment choice if you are participating in MassMutual Lifetime Income Protector. Additionally, this Fund is unavailable if your Contract was issued on or after 5/1/2010 and you are participating in the Guaranteed Minimum Accumulation Benefit.

Appendix C

Long-Term Guarantee Fixed Account Interest Rate Factor Adjustment Calculation

The Long-Term Guarantee Fixed Account interest rate factor is determined by the following formula:

$$\frac{(1 + a)(n/12)}{(1 + b)(n/12)}$$

a = The initial index rate. The initial index rate is the rate in the Treasury Constant Maturity Series determined for the week prior to the week in which we issue your Contract or the most recent renewal of a Long-Term Guarantee Fixed Account falls, for a maturity equal to the length of the current guarantee period.

b = The current index rate plus 0.25%. The current index rate is the interest rate in the Treasury Constant Maturity Series determined for the week prior to the week of the withdrawal, for a maturity equal to the number of whole months between the day of the withdrawal and the last day of the guarantee period.

n = The number of whole months left in the current guarantee period.

An interest rate factor adjustment for a partial withdrawal is calculated as follows:

$$\frac{(a + b) \times (c - 1)}{c}$$

a = the partial withdrawal payment from the Long-Term Guarantee Fixed Account

b = the Contingent Deferred Sales Charge for the partial withdrawal applicable to the Long-Term Guarantee Fixed Account

c = the interest rate factor

An interest rate factor adjustment for a full withdrawal is calculated as follows:

$$a \times (b - 1)$$

a = the Contract Fund value on the Business Day we receive the request for a full surrender in Good Order at our Service Center

b = the interest rate factor

The Contract Fund value is equal to your net Purchase Payment applicable to the Long-Term Guarantee Fixed Account on the day we issue your Contract. On any day after we issue your Contract, the Contract Fund value is equal to:

$$(a \times b) - c$$

a = the previous day's Contract Fund value

b = the sum of one plus the daily interest rate equivalent of the guaranteed interest rate

c = any Contract Fund value reduction made on that day

A negative interest rate factor adjustment will never result in a payment upon withdrawal that is lower than if the guaranteed rate of interest credited had been equal to the minimum guaranteed interest rate allowed in your state of issue.

Appendix D

Basic Death Benefit Examples

Example 1 ~ Impact of Purchase Payments and Determination of Benefit

The values shown are based on the following assumptions:

- Initial Purchase Payment = \$100,000
- A subsequent Purchase Payment of \$10,000 is made at beginning of Contract Year 2.
- Owner dies in Contract Year 5.

Beginning of Contract Year	Purchase Payment	Contract Value After Purchase Payment	Total Purchase Payments Adjusted for Withdrawals
1	\$100,000	\$100,000	\$100,000
2	10,000	115,000	110,000
5 (receive due proof of Owner's death and election of the payment method)		101,000	110,000

- On the Issue Date, a \$100,000 Purchase Payment is made. This is the initial total Purchase Payments adjusted for withdrawals.
- At the beginning of Contract Year 2, a \$10,000 subsequent Purchase Payment is made, bringing the total Purchase Payments adjusted for withdrawals to \$110,000.
- Owner dies in Contract Year 5. When we receive due proof of death and election of the payment method for the death benefit, the Contract Value is \$101,000. The total Purchase Payments adjusted for withdrawals is \$110,000. The Basic Death Benefit is the greater of these two values. Therefore, the death benefit is \$110,000.

Example 2 ~ Impact of Withdrawal and Determination of Benefit

The values shown are based on the following assumptions:

- Initial Purchase Payment = \$100,000.
- A subsequent Purchase Payment of \$10,000 is made at beginning of Contract Year 2.
- A withdrawal of \$30,000 is made at beginning of Contract Year 5.
- Owner dies in Contract Year 6.

Beginning of Contract Year	Purchase Payment	Withdrawal	Contract Value After Purchase Payment	Total Purchase Payments Adjusted for Withdrawals
1	\$100,000		\$100,000	\$100,000
2	10,000		115,000	110,000
5 (immediately prior to withdrawal)			120,000	110,000
5 (immediately after withdrawal)		\$30,000	90,000	82,500
6 (receive due proof of Owner's death and election of the payment method)			80,000	82,500

- On the Issue Date, a \$100,000 Purchase Payment is made. This is the initial total Purchase Payments adjusted for withdrawals.
- At the beginning of Contract Year 2, a \$10,000 subsequent Purchase Payment is made, bringing the total Purchase Payments adjusted for withdrawals to \$110,000.
- At the beginning of Contract Year 5, a \$30,000 withdrawal (including any CDSC) is made.
- Immediately prior to when the withdrawal is made, the Contract Value is \$120,000, and the total Purchase Payments adjusted for withdrawals is \$110,000.
- Immediately after the withdrawal is made, the Contract Value becomes \$90,000 ($\$120,000 - \$30,000 = \$90,000$), so the Contract Value has been reduced by 25% ($\$30,000/\$120,000$). The total Purchase Payments adjusted for withdrawals is reduced by \$27,500 ($25\% \times \$110,000$) to \$82,500 ($\$110,000 - \$27,500$).
- Owner dies in Contract Year 6. When we receive due proof of death and election of the payment method for the death benefit, the Contract Value is \$80,000. The total Purchase Payments adjusted for withdrawals is \$82,500. Therefore, the death benefit is \$82,500 (the greater of \$82,500 and \$80,000).

Example 3 ~ Impact of Reaching Age 80 when Contract is Issued before September 1, 2007

The values shown are based on the following assumptions:

- Contract is issued before September 1, 2007; therefore, given that the Owner is age 80 or above, the value of the Basic Death Benefit is the Contract Value as of the Business Day proof of death and election of payment method in Good Order are received.
- Initial Purchase Payment = \$100,000
- A subsequent Purchase Payment of \$10,000 is made at beginning of Contract Year 2.
- Owner reaches age 80 in Contract Year 5. Please see definition of age earlier in this prospectus.

Beginning of Contract Year	Purchase Payment	Contract Value After Purchase Payment	Total Purchase Payments Adjusted for Withdrawals
1	\$100,000	\$100,000	\$100,000
2	10,000	115,000	110,000
5 (Owner turns age 80)		101,000	N/A
6 (receive due proof of Owner's death and election of the payment method)		109,000	N/A

- On the Issue Date, a \$100,000 Purchase Payment is made. This is the initial total Purchase Payments adjusted for withdrawals.
- At the beginning of Contract Year 2, a \$10,000 subsequent deposit is made, bringing the total Purchase Payments adjusted for withdrawals to \$110,000.
- At the beginning of Contract Year 5, the Owner has turned age 80. The Contract Value is \$101,000 and the total Purchase Payments adjusted for withdrawals are no longer considered for valuing the death benefit.
- At the beginning of Contract Year 6, the Contract Value is \$109,000. Since the Owner is 80, the value of the Basic Death Benefit is the Contract Value as of the Business Day proof of death and election of payment method in Good Order are received. Therefore, the Basic Death Benefit is \$109,000.

Appendix E

Contingent Deferred Sales Charge (CDSC) Examples

Example 1~7 Year CDSC

- The following Purchase Payments are made:

Purchase Payment	Contract Year	Amount	End of Year Contract Value
1 (on Issue Date)	1	\$100,000	\$105,000
2	2	10,000	120,000
3	3	200,000	140,000

- On February 15 of Contract Year 4, a partial withdrawal of \$150,000 is made.
- To calculate the CDSC, we first determine the Free Withdrawal Amount (FWA) not subject to a CDSC. The FWA is 10% of the Contract Value as of the end of the prior year plus 10% of Purchase Payment 2 which is \$34,000 ($10\% \times \$140,000 + 10\% \times \$200,000$).
- We next determine the remaining withdrawal amount after the deduction of the free withdrawal amount which is \$116,000 ($\$150,000 - \$34,000$).
- Since the Withdrawal is being made in Contract Year 4, the CDSC charge is 6% or \$6,960 ($\$116,000 \times 6\%$).

The total CDSC for this withdrawal is \$6,960, which is deducted from the withdrawal amount of \$150,000. The net amount is \$143,040 ($\$150,000 - \$6,960$).

Example 2a ~ 9 Year CDSC

- The following Purchase Payments are made:

Purchase Payment	Contract Year	Date	Amount	End of Year Contract Value
1 (on Issue Date)	1	January 15	\$100,000	\$105,000
2	1	May 15	10,000	120,000
3	2	January 15	200,000	340,000
4	7	January 15	120,000	360,000

- In Contract Year 8, a partial withdrawal of \$250,000 is made.
- To calculate the CDSC, we first determine the Free Withdrawal Amount (FWA) not subject to a CDSC. The FWA is 10% of the Contract Value as of the end of the prior year plus 10% of Purchase Payment 4 which is \$48,000 ($10\% \times \$360,000 + 10\% \times \$120,000$).
- We next determine the remaining withdrawal amount after the deduction of the free withdrawal amount which is \$232,000 ($\$480,000 - \$48,000$).
- Since the Withdrawal is being made in Contract Year 8, the CDSC charge is 2% or \$4,640 ($\$232,000 \times 2\%$).
- The total CDSC for this withdrawal is \$4,640, which is deducted from the withdrawal amount of \$250,000. The net amount of \$245,360 ($\$250,000 - \$4,640$) is paid to the Owner, unless otherwise instructed.

Example 2b ~ 9 Year CDSC Credit

The values shown are based on the following assumption:

- In Contract Year 1, we credit your initial Purchase Payment of \$100,000 to your Contract.
- No other optional riders or features that provide a charge or credit are elected

Contract Year	Purchase Payment	Contract Value
1 (on Issue Date)	\$100,000	\$100,000
1 (End of year immediately prior to credit)	0	110,000
1 (End of year immediately after credit)	0	110,110

- At the end of the Contract Year, 0.10% of the Contract Value is credited your Contract for choosing a nine-year CDSC.
- In Contract Year 1 immediately prior to the credit, the Contract Value is \$110,000.
- 0.10% of the Contract Value is \$110 ($\$110,000 \times 0.10\%$).
- The 0.10% credit is then added to the Contract Value \$110,110 ($\$110,000 + \110).

This will occur at the end of each year that CDSC applies.

Appendix F

Free Withdrawal Amount (FWA) Examples

Example 1 ~ Impact of Additional Purchase Payment

The values shown are based on the following assumptions:

- Your Issue Date is 4/6/2004. This is the date when we credit your initial Purchase Payment of \$100,000 to your Contract.
- In Contract Year 2, an additional Purchase Payment of \$10,000 is made.
- In Contract Year 3, the Contract Value is \$125,000.

Based on the above, we have the following values for the calculation of the Free Withdrawal Amount.

Beginning of Contract Year	Transaction	Amount	End Prior Year Contract Value
1	Purchase Payment 1	\$100,000	N/A
2	Purchase Payment 2	10,000	\$102,000
3			125,000

In Contract Year 1, 10% of the first Purchase Payment of \$100,000 is \$10,000 which is the free withdrawal amount.

In Contract Year 2, the Free Withdrawal Amount is 10% of the end of year 1 Contract Value plus 10% of Purchase Payment 2 ($10\% \times \$102,000 + 10\% \times \$10,000$).

In Contract Year 3, 10% of the total Contract Value as of the end of the prior Contract Year is \$12,500 ($10\% \times \$125,000$), so the FWA is \$12,500.

Example 2 ~ Impact of Prior Withdrawal to Free Withdrawal Amount

This example is the same as Example 1 but has additional events that happen on or after Contract Year 3.

- Contract Year 1 is when we credit your initial Purchase Payment of \$100,000 to your Contract.
- In Contract Year 2, an additional Purchase Payment of \$10,000 is made.
- In Contract Year 3, the Contract Value is \$125,000.
- In Contract Year 4, an additional Purchase Payment of \$20,000 is made.
- In Contract Year 4, the Contract Value is \$125,000 and a partial withdrawal of \$11,000 is made.

Based on the above, we have the following values for the calculation of the Free Withdrawal Amount.

Beginning of Contract Year	Transaction	Amount	End Prior Year Contract Value
1	Purchase Payment 1	\$100,000	N/A
2	Purchase Payment 2	10,000	\$102,000
3	Withdrawal 1	15,000	125,000
4			120,000

- In Contract Year 1, 10% of the first Purchase Payment of \$100,000 is \$10,000 which is the free withdrawal amount.
- In Contract Year 2, the Free Withdrawal Amount is 10% of the end of year 1 Contract Value plus 10% of Purchase Payment 2 ($10\% \times \$102,000 + 10\% \times \$10,000$).
- In Contract Year 3, 10% of the total Contract Value is \$12,500 ($10\% \times \$125,000$), so the FWA is \$12,500. The withdrawal (\$15,000) is more than the \$12,500 FWA; thus, the remaining FWA is \$0 and the amount of the withdrawal that is subject to CDSC is \$2,500 ($\$15,000 - \$12,500$).
- In Contract Year 4, the FWA recalculates to 10% of the Contract Value which is \$12,000 ($10\% \times \$120,000$).

10%/20% Free Withdrawal Amount (FWA) Examples

Example 1 ~ Free Withdrawal Amount in Second Contract Year

The values shown are based on the following assumptions:

- In Contract Year 1, we credit your initial Purchase Payment of \$100,000 to your Contract.
- In Contract Year 2, an additional Purchase Payment of \$10,000 is made.
- In Contract Year 3, the Contract Value is \$125,000.

Based on the above, we have the following values for the calculation of the Free Withdrawal Amount.

Contract Year	Transaction	Transaction Amount	Contract Value	FWA
1	Purchase 1	\$100,000	\$100,000	\$10,000
1 (end of year, immediately prior to charge)			110,000	10,000
1 (end of year, immediately after the charge)	Charge	275	109,725	10,000
2 (end of year immediately prior to charge)	Purchase 2	10,000	119,725	23,945
2 (end of year immediately after the charge)	Charge	299	119,426	23,945
3 (end of year, immediately prior to charge)			125,000	25,000
3 (end of year, immediately after the charge)	Charge	313	124,687	25,000

In Contract Year 1, 10% of the first Purchase Payment of \$100,000 is \$10,000 which is the free withdrawal amount. At the end of the year, a charge of 0.25% is assessed against the Contract Value of for \$275 (\$110,000 x 0.25%). The ending Contract Value in year 1 is \$109,725 (\$110,000 – \$275).

In Contract Year 2, the Free Withdrawal Amount is 20% of the end of year 1 Contract Value plus 20% of Purchase Payment 2 (20% x \$109,725 + 20% x \$10,000).

In Contract Year 3, 20% of the total Contract Value is \$25,000 (20% x \$125,000), so the FWA is \$25,000. At the end of the year, a fee of 0.25% is assessed against the Contract Value of for 313 (\$125,000 x 0.25%). The ending Contract Value in year 3 is \$124,687 (\$125,000 – \$313).

Appendix G

Nursing Home Waiver Benefit Example

- The following Purchase Payments are made:

Purchase Payment	Transaction	Transaction Amount	Contract Value
1 (on Issue Date)	Purchase 1	\$100,000	\$100,000
1 (end of year, immediately prior to charge)			110,000
1 (end of year, immediately after the charge)	Charge	55	109,945
2 (end of year, immediately prior to charge)			120,000
2 (end of year, immediately after the charge)	Charge	60	119,940
3 (receive due proof in Good Order of Owner's admission to nursing care facility)	Withdrawal	50,000	69,940

- Total Purchase Payments are \$100,000.
- During the first year, a charge of \$55 is charged ($\$110,000 \times 0.05\%$) resulting in a Contract Value of \$109,945 ($\$110,000 - \55).
- During the second year, a charge of \$60 is charged ($\$120,000 \times 0.05\%$) resulting in a Contract Value of \$119,940 ($\$120,000 - \60).
- At the start of the third year, we receive due proof in Good Order of Owner's admission to a nursing care facility and the Owner withdraws \$50,000. There is no CDSC on the free withdrawal amount of \$11,994 ($\$119,940 \times 10\%$) and the CDSC is waived on the remaining \$38,006.

Appendix H

Ratchet Death Benefit Examples

Example 1 ~ Impact of Purchase Payments and Determination of Benefit

The values shown are based on the following assumptions:

- Initial Purchase Payment = \$100,000
- A subsequent Purchase Payment of \$10,000 is made at the beginning of Contract Year 2 and the Contract Value is \$105,000 prior to the addition of the Purchase Payment.
- The Contract Value at the beginning of Contract Year 3 is \$120,000.
- Owner dies in Contract Year 4.

Beginning of Contract Year	Purchase Payment	Contract Value After Purchase Payment	Annual Ratchet Death Benefit Amount
1	\$100,000	\$100,000	\$100,000
2 (immediately prior to Purchase Payment)		105,000	105,000
2 (immediately after Purchase Payment)	10,000	115,000	115,000
3		120,000	120,000
4 (receive due proof of Owner's death and election of the payment method)		110,000	120,000

- On the Issue Date, a \$100,000 Purchase Payment is made. This is the initial annual ratchet death benefit amount.
- At the beginning of Contract Year 2 immediately prior to the Purchase Payment, the Contract Value is \$105,000, so the annual ratchet death benefit amount is \$105,000 (greater of \$100,000 or \$105,000).
- At the beginning of Contract Year 2, a \$10,000 Purchase Payment is made. This amount increases the annual ratchet death benefit to \$115,000 (\$105,000 + \$10,000).
- At the beginning of Contract Year 3, the Contract Value is \$120,000 so the annual ratchet death benefit amount is \$120,000 (greater of \$115,000 or \$120,000).
- At the beginning of Contract Year 4, the Contract Value is \$110,000. This is less than the annual ratchet death benefit amount (\$120,000) so the annual ratchet death benefit amount does not change.
- Owner dies in Contract Year 4. When we receive due proof of death and election of the payment method for the death benefit, the Contract Value is \$110,000. The annual ratchet death benefit amount is \$120,000. The Ratchet Death Benefit is \$120,000 (the greater of \$110,000 or \$120,000).

Example 2 ~ Impact of Withdrawal and Determination of Benefit

The values shown are based on the following assumptions:

- Initial Purchase Payment = \$100,000. This is the initial annual ratchet death benefit amount.
- The Contract Value at the beginning of Contract Year 2 is \$105,000.
- A withdrawal of \$20,000 is made at beginning of Contract Year 3. Prior to the withdrawal, the Contract Value is \$100,000.
- Owner dies in Contract Year 4 with a Contract Value of \$83,000.

Beginning of Contract Year	Purchase Payment	Withdrawal	Contract Value After Purchase Payment	Annual Ratchet Death Benefit Amount
1	\$100,000		\$100,000	\$100,000
2			105,000	105,000
3 (immediately prior to withdrawal)			100,000	105,000
3 (immediately after withdrawal)		\$20,000	80,000	84,000
4 (receive due proof of Owner's death and election of the payment method)			83,000	84,000

- On the Issue Date, a \$100,000 Purchase Payment is made. This is the initial annual ratchet death benefit amount.
- At the beginning of Contract Year 2, the annual ratchet death benefit amount is set to \$105,000 because the Contract Value is greater than the annual ratchet death benefit amount (greater of \$100,000 or \$105,000).
- At the beginning of Contract Year 3 immediately prior to the withdrawal, the Contract Value is \$100,000, and the annual ratchet death benefit amount remains set to \$105,000 because this is greater than the Contract Value.
- At the beginning of Contract Year 3 after the withdrawal is made, the Contract Value becomes \$80,000 (\$100,000 - \$20,000 = \$80,000), so the Contract Value has been reduced by 20% (\$20,000 / \$100,000). The annual ratchet death benefit amount is reduced by \$21,000 (20% x \$105,000) to \$84,000 (\$105,000 - \$21,000).
- At the beginning of Contract Year 4, the Contract Value is \$83,000 and the annual ratchet death benefit amount is \$84,000. Because the annual ratchet death benefit amount is greater than the Contract Value, it stays at \$84,000.
- Owner dies in Contract Year 4. When we receive due proof of death and an election of the payment method for the death benefit, the Contract Value is \$83,000. The annual ratchet death benefit amount is \$84,000. Therefore, the death benefit is \$84,000 (the greater of \$83,000 or \$84,000).

Example 3 ~ Impact of Reaching Age 80

Please see definition of age earlier in this prospectus. The values shown are based on the following assumptions:

- Initial Purchase Payment = \$100,000
- The Contract Value at the beginning of Contract Year 2 is \$105,000.
- A subsequent Purchase Payment of \$10,000 is made at beginning of Contract Year 2.
- The Contract Value at the beginning of Contract Year 3 is \$120,000.
- Owner will be age 80 at the beginning of Contract Year 3.
- A subsequent Purchase Payment of \$20,000 is made at beginning of Contract Year 4.
- Owner dies in Contract Year 5 with a Contract Value of \$130,000.

Beginning of Contract Year	Purchase Payment	Withdrawal	Contract Value	Annual Ratchet Death Benefit Amount
1	\$100,000		\$100,000	\$100,000
2 (immediately prior to Purchase Payment)			105,000	105,000
2 (immediately after Purchase Payment)	10,000		115,000	115,000
3 (Owner turns age 80)			120,000	115,000
4	20,000		145,000	135,000
5 (receive due proof of Owner's death and election of the payment method)			130,000	135,000

- On the Issue Date, a \$100,000 Purchase Payment is made. This is the initial annual ratchet death benefit amount.
- At the beginning of Contract Year 2 immediately prior to the Purchase Payment, the Contract Value is \$105,000 and the annual ratchet death benefit amount is set to \$105,000.
- At the beginning of Contract Year 2, a \$10,000 Purchase Payment is made. This amount increases the annual ratchet death benefit to \$115,000 (\$105,000 + \$10,000).
- At the beginning of Contract Year 3, the Owner is age 80 so the annual ratchet death benefit amount is no longer compared to the Contract Value (\$120,000). Therefore, it will remain at \$115,000.
- At the beginning of Contract Year 4, a \$20,000 subsequent Purchase Payment is made. The annual ratchet death benefit amount is increased to \$135,000 (\$115,000 + \$20,000).
- Owner dies in Contract Year 5. When we receive due proof of death and election of the payment method for the death benefit, the Contract Value is \$130,000 due to negative market performance. The annual ratchet death benefit amount is \$135,000. Therefore, the ratchet death benefit is \$135,000 (greater of \$130,000 or \$135,000).

Appendix I

Contract Value Death Benefit Example

The values shown are based on the following assumptions:

- Initial Purchase Payment = \$100,000
- The Contract Value at the beginning of Contract Year 2 is \$100,000.
- A subsequent Purchase Payment of \$10,000 is made at beginning of Contract Year 2.
- Owner dies in Contract Year 5 with a Contract Value of \$120,060.

Beginning of Contract Year	Purchase Payment	Contract Value
1	\$100,000	\$100,000
2 (immediately prior to credit)		100,000
2 (immediately prior to Purchase Payment after the credit)		100,050
2 (immediately after Purchase Payment)	10,000	110,050
3 (immediately prior to credit)		120,000
3 (immediately after credit prior to death)		120,060
3 (receive due proof of Owner's death and election of the payment method, and after the credit)		120,060

- On the Issue Date, a \$100,000 Purchase Payment is made. This is the initial Contract Value death benefit amount.
- At the beginning of Contract Year 2 immediately prior to the Purchase Payment, the Contract Value is \$100,000. Once the credit is applied, then the Contract Value becomes \$100,050 ($100,000 \times 0.05\% + 100,000$).
- At the beginning of Contract Year 2, a \$10,000 Purchase Payment is made. This amount increases the Contract Value death benefit to \$110,050 ($\$100,050 + \$10,000$).
- At the beginning of Contract Year 3, immediately prior to the credit, the Contract Value is \$120,000. After the credit is applied the Contract Value increases to \$120,060 ($\$120,000 \times 0.05\% + \$120,000$).
- Owner dies in Contract Year 5. When we receive due proof of death and election of the payment method for the death benefit, the Contract Value is \$120,060.

Appendix J

Guaranteed Minimum Accumulation Benefit (10-Year Benefit) Examples

Example 1 ~ Setting of Initial Values

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000

Contract Year (beginning of year)	Purchase Payment	Withdrawal	Contract Value	GMAB Value
1	\$100,000	\$0	\$100,000	\$100,000

- On the Issue Date, the GMAB value is equal to the initial Purchase Payment. The GMAB value will be increased by any Purchase Payments received in the first two Contract Years.

Example 2 ~ Annual Reset

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMAB Value	Death Benefit
1	61	\$100,000	\$0	\$107,085	\$100,000	\$107,085
2	62			114,672	114,672	114,672
3	63			122,796	122,796	122,796
4	64			131,496	131,496	131,496
5	65			140,813	140,813	140,813
6	66			150,789	140,813	150,789
7	67			161,473	140,813	161,473
8	68			172,913	140,813	172,913
9	69			185,164	140,813	185,164
10	70			198,282	140,813	198,282
11	71			212,330	140,813	212,330
12	72			227,374	140,813	227,374
13	73			243,483	140,813	243,483
14	74			260,864	140,813	260,864
15	75			279,486	140,813	279,486
16 (beginning of Contract Year)	76			300,791	0	300,791

- On the Issue Date, the GMAB value is equal to the initial Purchase Payment of \$100,000.
- Beginning on the second Contract Anniversary, the Owner resets the GMAB to the Contract Value. The Owner requests this reset each Contract Year through year five.
- At the end of the tenth Contract Year from the last reset, the Contract Value is greater than the GMAB value. The Contract Value remains as is, and the GMAB value is set to zero. The GMAB now terminates.

Example 3 ~ Impact of a Withdrawal

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMAB Value	Death Benefit
1	61	\$100,000	\$ 0	\$107,085	\$100,000	\$107,085
2	62		0	114,672	100,000	114,672
3	63		0	122,796	100,000	122,796
4	64		0	131,496	100,000	131,496
5	65		0	140,813	100,000	140,813
6	66		0	150,789	100,000	150,789
7	67		0	161,473	100,000	161,473
8	68		15,000	157,913	91,325	157,913
9	69		0	169,101	91,325	169,101
10	70		0	181,082	91,325	181,082
11	71		0	194,788	0	194,788

- On the Issue Date, the GMAB value is equal to the initial Purchase Payment of \$100,000.
- The Owner does not elect to reset the benefit.
- A withdrawal of \$15,000 is taken in Contract Year eight.
- As a result of the withdrawal, the GMAB value is reduced in direct proportion to the Contract Value reduction for the withdrawal.
- The Contract Value prior to withdrawal = \$172,913.
- The GMAB value after the withdrawal = GMAB value prior to the withdrawal – ((withdrawal / Contract Value prior to the withdrawal) x (GMAB value prior to the withdrawal)).

GMAB value = \$100,000 – ((\$15,000 / \$172,913) x (\$100,000)) = \$100,000 – \$8,675 = \$91,325.

The Contract Value is reduced for the amount of the withdrawal. The return of premium portion of the death benefit is reduced proportionately for the withdrawal.

- At the end of the tenth Contract Year, the Contract Value is greater than the GMAB value. The Contract Value remains as is, and the GMAB value is set to zero. The GMAB now terminates.

Example 4 ~ Additional Purchase Payments

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMAB Value	Death Benefit
1	61	\$100,000	\$0	\$107,085	\$100,000	\$107,085
2	62	25,000		141,443	125,000	141,443
3	63	25,000		178,235	125,000	178,235
4	64	25,000		217,635	125,000	217,635
5	65	0		233,054	125,000	233,054
6	66	0		249,566	125,000	249,566
7	67	0		267,381	125,000	267,381
8	68	0		286,468	125,000	286,468
9	69	0		306,917	125,000	306,917
10	70	0		328,826	125,000	328,826
11	71	0		353,892	0	353,892

- On the Issue Date, the GMAB value is equal to the initial Purchase Payment of \$100,000.
- The Owner does not elect to reset the benefit.
- Additional Purchase Payments are made in the beginning of Contract Years two, three and four.
- The GMAB value is increased for the Purchase Payment made in the second Contract Year.
- The GMAB value is not increased for the Purchase Payments made in Contract Years three and four.

At the end of the tenth Contract Year, the Contract Value attributed to the Purchase Payments in Contract Years one and two is \$234,876 = \$328,826 x (\$125,000 / \$175,000). The applicable Contract Value attributed to Purchase Payments made during Contract Years one and two adjusted for withdrawals and investment performance (\$234,876) is compared to the GMAB value to determine the GMAB credit. Since this is greater than the GMAB value of \$125,000, the Contract Value remains as is, and the GMAB value is set to zero. If the GMAB value exceeds the applicable Contract Value attributed to Purchase Payments made during Contract Years one and two adjusted for withdrawals and investment performance (\$234,876), we will increase the Contract Value to equal the GMAB value. The GMAB now terminates.

Appendix K

Guaranteed Minimum Accumulation Benefit (20-Year) Examples

Example 1 ~ Setting of Initial Values

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as the Owner
- Initial Purchase Payment = \$100,000

Contract Year (beginning of year)	Purchase Payment	Withdrawal	Contract Value	GMAB Value
1	\$100,000	—	\$100,000	\$200,000

- On the Issue Date, the GMAB value is equal to the initial Purchase Payment multiplied by two, in this case \$200,000 (\$100,000 x 2).

Example 2 ~ Impact of a Withdrawal on the GMAB Value

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as the Owner
- Initial Purchase Payment = \$100,000
- In Contract Year 8, a withdrawal of \$15,000 is made.

Contract Year (end of year)	Purchase Payment	Withdrawal	Contract Value	GMAB Value
1	\$100,000	—	\$107,085	\$200,000
2		—	114,672	200,000
3		—	122,796	200,000
4		—	131,496	200,000
5		—	140,813	200,000
6		—	150,789	200,000
7		—	161,473	200,000
8 (prior to the withdrawal)		—	172,913	200,000
8 (after the withdrawal)		\$15,000	157,913	182,650
9		—	169,101	182,650
10		—	181,082	182,650
20		—	359,052	182,650
21		—	384,491	N/A

- On the Issue Date, the GMAB Value is equal to the initial Purchase Payment multiplied by two, \$200,000 (\$100,000 x 2).
- A withdrawal of \$15,000 is taken in Contract Year eight.
- The Contract Value prior to the withdrawal is \$172,913.
- The Contract Value after the withdrawal is \$157,913 (\$172,913 – \$15,000).
- As a result of the withdrawal, the GMAB value is reduced in direct proportion to the Contract Value reduction for the withdrawal.
 - The Contract Value prior to the withdrawal is \$172,913.
 - The Contract Value after the withdrawal is \$157,913 (\$172,913 – \$15,000).
 - The GMAB value after the withdrawal = GMAB value prior to the withdrawal – ((withdrawal/Contract Value prior to the withdrawal) x (GMAB value prior to the withdrawal)).
 - Impact of Withdrawal on GMAB Value Calculation:

$$(\$15,000/\$172,913) \times \$200,000 = \$17,350$$

$$\text{GMAB Value} = \$200,000 - \$17,350 = \$182,650.$$

- At the end of the twentieth Contract Year, the Contract Value (\$359,052) is greater than the GMAB value (\$182,650). The Contract Value remains and the GMAB rider terminates with no further charges occurring.

Example 3 ~ Additional Purchase Payments

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as the Owner
- Initial Purchase Payment = \$100,000
- In Contract Years 2, 3, and 4, additional Purchase Payments of \$25,000 are made.

Contract Year (end of year)	Purchase Payment	Contract Value	GMAB Value
1	\$100,000	\$107,085	\$200,000
2	25,000	141,443	\$250,000
3	25,000	178,235	\$250,000
4	25,000	217,635	\$250,000
5		233,054	\$250,000
6		249,566	\$250,000
7		267,248	\$250,000
8		286,183	\$250,000
9		306,459	\$250,000
10		328,171	\$250,000
20		650,709	\$250,000
21		696,812	N/A

- On the Issue Date, the GMAB Value is equal to the initial Purchase Payment multiplied by two, \$200,000 (\$100,000 x 2).
- Additional Purchase Payments are made in the beginning of Contract Years two, three, and four.
- The GMAB value is increased for the Purchase Payment made in the second Contract Years, \$250,000 (\$200,000 + (\$25,000 x 2)).
- The GMAB value is not increased for the Purchase Payments made in Contract Years three and four because only Purchase Payments made during the first two Contract Years are added to the GMAB value.
- At the end of the 20th Contract Year:
 - The Contract Value attributed to the Purchase Payments in Contract Years 1 and 2 is \$464,792 (\$650,709 x (\$125,000/\$175,000)).
 - The Contract Value attributed to the Purchase Payments of Contract Years 1 and 2 (\$464,792) is greater than the GMAB value (\$250,000).
- The Contract Value remains and the GMAB rider terminates with no further charges occurring.

Appendix L

Basic Guaranteed Minimum Income Benefit (GMIB) Examples

Example 1 ~ Setting of Initial Values

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- No withdrawals are taken

Beginning of Contract Year	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Monthly Income Benefit
1 (immediately before the charge)	\$100,000	\$0	\$100,000	\$ 100,000	\$0
1 (after the charge)	0	0	\$ 99,400	100,0000	0

- On the Issue Date, a \$100,000 Purchase Payment is made, the GMIB value is equal to the initial Purchase Payment (\$100,000). There is a charge of 0.60% which is \$600 ($\$100,000 \times 0.60\%$). Therefore, the Contract Value is \$99,400; however, the GMIB value remains at \$100,000.

Example 2 ~ No Withdrawals

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- No withdrawals are taken
- Death benefit = Basic Death Benefit
- GMIB is exercised at the end of Year 10.

Contract Year (end of year)	Purchase Payment	Contract Value	GMIB Value	Monthly Income Benefit	Death Benefit
1	\$100,000	\$103,000	\$105,000	\$ 0	\$103,000
2		111,000	110,250	0	111,000
3		114,000	115,763	0	114,000
4		120,000	121,551	0	120,000
5		125,000	127,628	0	125,000
6		135,000	134,010	0	135,000
7		139,000	140,710	0	139,000
8		148,000	147,746	0	148,000
9		155,000	155,133	0	155,000
10 (immediately prior exercising GMIB)		161,000	162,889	0	161,000
10 (immediately after exercising GMIB)		0	0	831	0

- On the Issue Date, a \$100,000 Purchase Payment is made, the GMIB value is equal to the initial Purchase Payment. The GMIB value is increased by 5% (\$105,000) at the end of Contract Year 1.
- On the first day of each Contract Year the GMIB value is increased by 5%.
- At the end of the seventh Contract Year, the GMIB can be exercised and begin an income stream. The GMIB is annuitized at the tenth Contract Year. The Monthly Income Benefit Value of \$831 is the monthly income amount that would be received by annuitizing the GMIB value of \$162,889 for a male age 70 for a life income Annuity Option.

Example 3 ~ Impact of Withdrawal and Determination of Benefit

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Monthly Income Benefit	Death Benefit
1	\$100,000	\$ 0	\$103,000	\$105,000	\$0	\$103,000
2			111,000	110,250	0	111,000
3			114,000	115,763	0	114,000
4			120,000	121,551	0	120,000
5 (immediately before withdrawal)			125,000	127,628	0	125,000
5 (immediately after withdrawal)		5,000	120,000	127,628	0	120,000
6			124,000	122,523	0	124,000

- On the Issue Date, a \$100,000 Purchase Payment is made, the GMIB value is equal to the initial Purchase Payment. The GMIB Value is increased by 5% (\$105,000) at the end of Contract Year 1.
- Each Contract Year the GMIB value accumulates at 5% on an annualized basis (compounded daily).
- In Contract Year 5, \$5,000 is withdrawn leaving the Contract Value at \$120,000 (\$125,000 – \$5,000). The GMIB Value is reduced pro rata by 4% (\$5,000/\$125,000), which is a reduction of \$5,105 (\$127,628 x 4%) and results in a GMIB value of \$122,523 (\$127,628 – \$5,105).

Example 4 ~ Impact of Reaching Age 80

The values shown are based on the following assumptions:

- Owner Age at issue = 75
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- No withdrawals are taken
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Purchase Payment	Contract Value	GMIB Value	Monthly Income Benefit	Death Benefit
1	\$100,000	\$103,000	\$105,000	\$0	\$103,000
2		111,000	110,250	0	111,000
3		114,000	115,763	0	114,000
4		120,000	121,551	0	120,000
5		125,000	127,628	0	125,000
6		135,000	127,628	0	135,000

- On the Issue Date, a \$100,000 Purchase Payment is made, the GMIB value is equal to the initial Purchase Payment. The GMIB Value is increased by 5% (\$105,000) at the end of Contract Year 1.
- Each Contract Year the GMIB value accumulates at 5% on an annualized basis (compounded daily).
- At the end of Contract Year 5, the Annuitant has turned 80 and we no longer credit the interest; therefore, the GMIB Value will no longer increase and will remain \$127,628 unless a withdrawal is taken.

Example 5 ~ Impact of Reaching the GMIB Cap

The values shown are based on the following assumptions:

- Owner Age at issue = 50
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Death Benefit
1	\$100,000	\$ 0	\$103,000	\$105,000	\$103,000
2 (immediately before Purchase Payment)			111,000	110,250	111,000
2 (immediately after Purchase Payment)	10,000		121,000	120,250	121,000
5 (immediately before withdrawal)			125,000	139,204	125,000
5 (immediately after withdrawal)		5,000	120,000	133,636	120,000
10			160,000	170,557	160,000
14			199,000	207,314	199,000
15			215,000	211,200	215,000

- On the Issue Date, a \$100,000 Purchase Payment is made, the GMIB value is equal to the initial Purchase Payment. The GMIB Value is increased by 5% (\$105,000) at the end of Contract Year 1. The GMIB cap is equal to \$200,000 which is twice the Purchase Payment (\$100,000 x 2).
- Each Contract Year the GMIB value accumulates at 5% on an annualized basis (compounded daily).
- In Contract Year 2, \$10,000 are deposited making the Contract Value at \$121,000 (\$111,000 + \$10,000). The GMIB Value increases to \$120,250 (\$110,250 + 10,000). The GMIB Cap increases by \$20,000 (\$10,000 x 2) which is twice the Purchase Payment; the new GMIB Cap becomes \$220,000 (\$200,000 + \$20,000).
- In Contract Year 5, \$5,000 are withdrawn leaving the Contract Value at \$120,000 (\$125,000 – \$5,000). The GMIB Value is reduced pro rata by 4% (\$5000/\$125000) which is a reduction of \$5,568 (\$139,204 x 4%), and results in a GMIB value of \$133,636 (\$139,204 – \$5,568). The GMIB Cap is also reduced pro rata by 4% which is a reduction of \$8,800 (\$220,000 x 4%) and results in a GMIB Cap of \$211,200.
- At the end of Contract Year 15, since the GMIB value cannot be greater than the Purchase Payments made in the first two years, the GMIB is capped at \$211,200. Once the cap is reached, we will no longer credit the interest and the GMIB Value will remain the same unless a subsequent withdrawal is taken.

Appendix M

MassMutual Guaranteed Income Plus 5SM Examples – 2008 Version

Example 1 ~ Setting of Initial Values

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- No withdrawals are taken

Contract Year (beginning of year)	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Monthly Income Benefit
1	\$100,000	\$0	\$100,000	\$105,000	\$0

- On the Issue Date, the GMIB value is equal to the initial Purchase Payment increased by 5%.

Example 2 ~ No Withdrawals

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Monthly Income Benefit	Death Benefit
1	61	\$100,000	\$0	\$104,916	\$105,000	\$ 0	\$104,916
2	62			110,074	110,250	0	110,074
3	63			115,485	115,763	0	115,485
4	64			121,161	121,551	0	121,161
5	65			127,115	127,628	0	127,115
6	66			133,361	134,010	0	133,361
7	67			139,913	140,710	0	139,913
8	68			146,786	147,746	0	146,786
9	69			153,996	155,133	0	153,996
10	70			161,559	162,889	831	161,559

- On the Issue Date, the GMIB value is equal to the initial Purchase Payment increased by 5%.

- On the first day of each Contract Year, the GMIB value is increased by 5%.
- At the end of the tenth Contract Year, the GMIB can be exercised and begin an income stream. The Monthly Income Benefit value of \$831 is the monthly income amount that would be received by annuitizing the GMIB value of \$162,889 for a male age 70 for a life income Annuity Option.

Example 3 ~ Withdrawals Reducing the GMIB Value Dollar

for Dollar

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Monthly Income Benefit	Death Benefit
1	61	\$100,000	\$ 0	\$104,916	\$105,000	\$ 0	\$104,916
2	62		5,250	104,833	105,000	0	104,833
3	63		5,250	104,744	105,000	0	104,744
4	64		5,250	104,651	105,000	0	104,651
5	65		5,250	104,552	105,000	0	104,552
6	66		5,250	104,448	105,000	0	104,448
7	67		5,250	104,337	105,000	0	104,337
8	68		5,250	104,221	105,000	0	104,221
9	69		5,250	104,098	105,000	0	104,098
10	70		5,250	103,968	105,000	535	103,968

- On the Issue Date, the GMIB value is equal to the initial Purchase Payment increased by 5%.
- On the first day of each Contract Year, the GMIB value is increased by 5%.
- Beginning in the second Contract Year, withdrawals of the GMIB interest are taken; the GMIB value is reduced dollar for dollar since the withdrawals are equal to the GMIB interest.
- The Contract Value is reduced by the amount of the withdrawals. The return of premium aspect of the death benefit is reduced proportionately for the withdrawals.
- At the end of the tenth Contract Year, the GMIB can be exercised and begin an income stream. The Monthly Income Benefit value of \$535 is the monthly income amount that would be received by annuitizing the GMIB value of \$105,000 for a male age 70 for a life income Annuity Option.

Example 4 ~ Annual Reset

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Monthly Income Benefit	Death Benefit
At Issue	60	\$100,000	\$0	\$100,000	\$105,000	\$0	\$100,000
1	61			106,867	106,867		106,867
2	62			114,206	114,206		114,206
3	63			122,050	122,050		122,050
4	64			130,431	130,431		130,431
5	65			139,388	139,388		139,388
6	66			148,961	148,961		148,961
7	67			159,191	159,191		159,191
8	68			170,123	170,123		170,123
9	69			181,806	181,806		181,806
10	70			194,291	194,291		194,291

- On the Issue Date, the GMIB value is equal to the initial Purchase Payment increased by 5%.
- On the first day of each Contract Year, the GMIB value is increased by 5%.
- Each Contract Anniversary, prior to the Annuitant attaining age 81, if your Contract Value is greater than your GMIB value, we will reset your GMIB value to equal your Contract Value (unless you instruct otherwise by Written Request). The GMIB value will then be increased by 5%.
- At the end of the tenth Contract Year from the last reset, the GMIB can be exercised and begin an income stream.

Example 5 ~ Additional Purchase Payments

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Monthly Income Benefit	Death Benefit
1	61	\$100,000	\$0	\$104,916	\$105,000	\$0	\$104,916
2	62	25,000		136,303	136,500		136,303
3	63	25,000		169,407	169,407		169,407
4	64	25,000		204,139	204,139		204,139
5	65	0		214,175	214,346		214,175
6	66	0		224,704	225,063		224,704
7	67	0		235,749	236,316		235,749
8	68	0		247,336	248,132		247,336
9	69	0		259,620	260,538		259,620
10	70	0		272,514	273,565		272,514

- On the Issue Date, the GMIB value is equal to the initial Purchase Payment increased by 5%.
- On the first day of each Contract Year, the GMIB value is increased by 5%.
- A Purchase Payment of \$25,000 is made at the beginning of Contract Years two, three and four.
- The GMIB value in Contract Year two is increased by the amount of the Purchase Payment.
- The Purchase Payments in Contract Years three and four are not included in the GMIB value, although the GMIB value increases due to the automatic reset.
- At the end of the tenth Contract Year from the last reset, the GMIB can be exercised and begin an income stream.

Example 6 ~ 60% GMIB Value at Age 90

The values shown are based on the following assumptions:

- Owner Age at issue = 75
- Annuitant = same as Owner
- Initial Purchase Payment = \$125,000
- Rider effective date = Issue Date
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Monthly Income Benefit	Death Benefit
1	76	\$125,000	\$6,250	\$117,590	\$125,000	\$ 0	\$118,702
2	77		6,250	110,199	125,000	0	112,342
3	78		6,250	102,827	125,000	0	105,917
4	79		6,250	95,473	125,000	0	99,422
5	80		6,250	88,098	125,000	0	92,853
6	81		6,250	80,742	125,000	0	86,200
7	82		6,250	73,405	125,000	0	79,457
8	83		6,250	66,086	125,000	0	72,615
9	84		6,250	58,786	125,000	0	65,663
10	85		6,250	51,504	125,000	1,142	58,587
11	86		6,250	44,241	125,000	1,199	51,369
12	87		6,250	36,997	125,000	1,259	43,987
13	88		6,250	44,241	125,000	1,324	36,406
14	89		6,250	22,563	125,000	1,393	28,575
15	90		6,250	75,000	125,000	0	75,000

- On the Issue Date, the GMIB value is equal to the initial Purchase Payment increased by 5%.
- Each Contract Year the GMIB value is increased by 5%.
- Withdrawals of the allowable GMIB amount are taken each Contract Year.
- At the end of the fifteenth Contract Year, the Owner elects not to annuitize the GMIB value. Because the Contract Value is below 60% of the GMIB value in this example, the Contract Value is increased to 60% of the GMIB value at age 90. The GMIB terminates.

Example 7 ~ Impact of Contingent Deferred Sales Charge

(CDSC) When 5% Withdrawn is Greater than Free Withdrawal Allowance
The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Rider effective date = Issue Date
- Death benefit = Basic Death Benefit

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Death Benefit
1	61	\$100,000	\$5,000	\$82,352	\$100,000	\$94,288
2	62		5,000	66,820	100,000	87,740
3	63		5,000	53,150	100,000	80,219
4	64		5,000	41,119	100,000	71,555
5	65		5,000	30,484	100,000	61,442

- On the Issue Date, the GMIB value is equal to the initial Purchase Payment increased by 5%.
- On the first day of each Contract Year, the GMIB value is increased by 5%.
- Withdrawals of the allowable GMIB amount are taken each Contract Year.
- In the fifth Contract Year, the free withdrawal amount is \$4,112. The amount withdrawn of \$5,000 is greater than the 10% free withdrawal amount. The Contract Value is reduced by the withdrawal amount including any applicable CDSC. The CDSC is assessed on the value withdrawn in excess of the free withdrawal amount. The GMIB value remains at \$100,000; it is not reduced by the CDSC, as the amount withdrawn is not greater than the allowed GMIB amount.
- The return of premium aspect of the death benefit is reduced proportionately for the withdrawals.

Example 8 ~ Applying GMIB Value to an Annuity Option with Additional Purchase Payments Made After Last GMIB Value Reset

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Annuitant = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit
- Owner requests in writing that automatic resets discontinue after the reset at the end of Contract Year 3.
- GMIB is exercised at the end of Contract Year 13.

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	GMIB Value	Monthly Income Benefit	Death Benefit
1	61	\$100,000	\$0	\$104,916	\$105,000	\$0	\$104,916
2	62	25,000		136,303	136,500		136,303
3	63	25,000		169,407	169,407		169,407
4	64	25,000		202,183	177,877		176,183
5	65	0		210,271	186,771		183,231
6	66	0		218,681	196,110		190,560
7	67	0		227,429	205,915		198,182
8	68	0		236,526	216,211		206,110
9	69	0		245,987	227,022		214,354
10	70	0		255,826	238,373		222,928
11	71	0		266,059	250,291		231,845
12	72	0		276,702	262,806		241,119
13	73	0		287,770	275,946		250,764

- On the Issue Date, the GMIB value is equal to the initial Purchase Payment increased by 5%.
- On the first day of each Contract Year, the GMIB value is increased by 5%.
- A Purchase Payment of \$25,000 is made at the beginning of Contract Years two, three and four.
- The GMIB value in Contract Year two is increased by the amount of the Purchase Payment plus credited GMIB interest.
- The Purchase Payment in Contract Year three is not included in the GMIB value because it is made after the second Contract Year, although the GMIB value increases due to the automatic reset.
- At the end of the tenth Contract Year from the last reset, the GMIB can be exercised and begin an income stream. So, the GMIB can be first exercised at the end of Contract Year 13.
- The Purchase Payment in Contract Year four is not included in the GMIB value because it is made after the most recent GMIB value reset, although the GMIB value continues to increase at 5%.
- The GMIB is exercised at the end of Contract Year 13. The GMIB value as of the last reset at the end of Contract Year three is \$169,407. An additional Purchase Payment of \$25,000 was made in Contract Year four after the most recent reset that occurred at the end of Contract Year three. The GMIB as of the last reset plus additional Purchase Payments made after the most recent reset is \$194,407 (\$169,407 + \$25,000). The Contract Value is \$287,770. The percentage used to determine the amount of Contract Value applied to the GMIB is 87.14% (\$169,407 / \$194,407). The amount of Contract Value applied to the exercise of GMIB is \$240,459 (\$275,946 x 87.14%). The cash value remaining in the

Contract after the exercise of the GMIB is \$35,487 ($\$275,946 - \$240,459$).

Appendix N

MassMutual Lifetime Income ProtectorSM Examples

All values reflected are end of year values, unless otherwise noted. Examples assume withdrawals occur at the end of the year.

Example 1 ~ Setting of Initial Values

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Covered person = same as Owner
- Initial Purchase Payment = \$100,000

Contract Year	Purchase Payment	Withdrawal	Contract Value	Income Base
1	\$100,000	\$0	\$100,000	\$100,000

On the Issue Date, the Income Base is equal to the initial Purchase Payment. The Income Base will be increased for additional Purchase Payments received prior to the end of the second Contract Year. The Income Base will not increase for Purchase Payments received in Contract Years three and later.

Example 2 ~ Single Life Option, Single Deposit, Income Percentage Increases After Income Begins

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Single life option is elected.
- Covered person = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year	Age (Beginning of Year)	Purchase Payment	Withdrawal	Contract Value	Income Base	Income Percentage	Guaranteed Income Floor	Annual Income Amount	Death Benefit
1	60	\$100,000	\$ 0	\$104,622	\$100,000	0	\$ 0	\$ 0	\$104,622
2	61		0	109,502	100,000	0	0	0	109,502
3	62		0	114,655	100,000	0	0	0	114,655
4	63		0	120,097	100,000	0	0	0	120,097
5	64		0	125,843	100,000	0	0	0	125,843
6	65		0	131,909	100,000	4.50%	4,500	5,663	131,909
7	66		0	138,316	100,000	4.50%	4,500	5,936	138,316
8	67		0	145,080	100,000	4.50%	4,500	6,224	145,080
9	68		0	152,223	100,000	4.50%	4,500	6,529	152,223
10	69		0	159,765	100,000	4.50%	4,500	6,850	159,765
11	70		7,988	159,740	100,000	5.00%	5,000	7,988	159,740
12	71		7,987	159,715	100,000	5.00%	5,000	7,987	159,715
13	72		7,986	159,690	100,000	5.00%	5,000	7,986	159,690
14	73		7,985	159,666	100,000	5.00%	5,000	7,985	159,666
15	74		7,983	159,640	100,000	5.00%	5,000	7,983	159,640
16	75		8,780	158,817	100,000	5.50%	5,500	8,780	158,817
17	76		8,735	157,993	100,000	5.50%	5,500	8,735	157,993

- The Income Base is established as the initial Purchase Payment.
- The Annual Income Amount and the Guaranteed Income Floor are calculated on the Income Eligibility Date.
- Withdrawals of the Annual Income Amount begin at age 70, triggering lifetime income.
- The Income Percentage is established at 5% (age 70 is age of first withdrawal).
- The Income Percentage increases due to market performance in Contract Year 16. This is the year the Covered Person moves into a new age range and the Contract Value is greater than the Income Base.

Example 3 ~ Joint Life Option, Single Deposit, Income Percentage Increases After Income Begins

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Beneficiary (spouse of Owner) = 57
- Covered person = same as Owner
- Second covered person = same as Beneficiary
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year	Owner Age (Beginning of Year)	Beneficiary Age (Beginning of Year)	Purchase Payment	Withdrawal	Contract Value	Income Base	Income Percentage	Guaranteed Income Floor	Annual Income Amount	Death Benefit
1	60	57	\$100,000	\$ 0	\$104,622	\$100,000	0	\$ 0	\$ 0	\$104,622
2	61	58		0	109,502	100,000	0	0	0	109,502
3	62	59		0	114,655	100,000	0	0	0	114,655
4	63	60		0	120,097	100,000	0	0	0	120,097
5	64	61		0	125,843	100,000	0	0	0	125,843
6	65	62		4,404	127,505	100,000	3.50%	3,500	4,404	127,505
7	66	63		4,463	129,202	100,000	3.50%	3,500	4,463	129,202
8	67	64		4,522	130,935	100,000	3.50%	3,500	4,522	130,935
9	68	65		5,237	132,049	100,000	4.00%	4,000	5,237	132,049
10	69	66		5,282	133,181	100,000	4.00%	4,000	5,282	133,181
11	70	67		5,327	134,331	100,000	4.00%	4,000	5,327	134,331
12	71	68		5,373	135,499	100,000	4.00%	4,000	5,373	135,499
13	72	69		5,420	136,686	100,000	4.00%	4,000	5,420	136,686
14	73	70		6,151	137,209	100,000	4.50%	4,500	6,151	137,209
15	74	71		6,174	137,737	100,000	4.50%	4,500	6,174	137,737
16	75	72		6,198	138,271	100,000	4.50%	4,500	6,198	138,271
17	76	73		6,222	138,810	100,000	4.50%	4,500	6,222	138,810

- The Income Base is established as the initial Purchase Payment.
- The Annual Income Amount and the Guaranteed Income Floor are calculated on the Income Eligibility Date, based on the age of the younger covered person.
- Withdrawals of the Annual Income Amount begin in year 6 (age 62 of the younger covered person), triggering lifetime income.
- The Income Percentage is established at 3.50% (age 62 is age of first withdrawal).
- The Income Percentage increases due to market performance in Contract Years 9 and 14. These are the years the younger Covered Person moves into a new age range and the Contract Value is greater than the Income Base.

Example 4 ~ Single Life Option, Single Deposit, Income Percentage Does Not Increase After Income Begins

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Single life option is elected.
- Covered person = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year	Age (Beginning of Year)	Purchase Payment	Withdrawal	Contract Value	Income Base	Income Percentage	Guaranteed Income Floor	Annual Income Amount	Death Benefit
1	60	\$100,000	\$ 0	\$99,711	\$100,000	0	\$ 0	\$ 0	\$100,000
2	61		0	99,419	100,000	0	0	0	100,000
3	62		0	99,126	100,000	0	0	0	100,000
4	63		0	98,830	100,000	0	0	0	100,000
5	64		0	98,533	100,000	0	0	0	100,000
6	65		0	98,233	100,000	4.50%	4,500	4,500	100,000
7	66		0	97,931	100,000	4.50%	4,500	4,500	100,000
8	67		0	97,627	100,000	4.50%	4,500	4,500	100,000
9	68		0	97,321	100,000	4.50%	4,500	4,500	100,000
10	69		0	97,013	100,000	4.50%	4,500	4,500	100,000
11	70		5,000	91,702	100,000	5.00%	5,000	5,000	95,000
12	71		5,000	86,355	100,000	5.00%	5,000	5,000	90,000
13	72		5,000	80,969	100,000	5.00%	5,000	5,000	85,000
14	73		5,000	75,546	100,000	5.00%	5,000	5,000	80,000
15	74		5,000	70,085	100,000	5.00%	5,000	5,000	75,000
16	75		5,000	64,585	100,000	5.00%	5,000	5,000	70,000
17	76		5,000	59,047	100,000	5.00%	5,000	5,000	65,000

- The Income Base is established as the initial Purchase Payment.
- The Annual Income Amount and the Guaranteed Income Floor are calculated on the Income Eligibility Date.
- Withdrawals of the Annual Income Amount begin at age 70, triggering lifetime income.
- The Income Percentage is established at 5% (age 70 is age of first withdrawal).
- The Income Percentage does not increase, as the Contract Value is not greater than the Income Base, when the Covered Person moves into a new age range (year 16 in this example.)

Example 5 ~ Single Life Option, Single Deposit, Excess Withdrawal

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Covered person = same as Owner
- Initial Purchase Payment = \$100,000
- Death benefit = Basic Death Benefit

Contract Year	Age (Beginning of Year)	Purchase Payment	Withdrawal	Contract Value	Income Base	Income Percentage	Guaranteed Income Floor	Annual Income Amount	Death Benefit
1	60	\$100,000	\$ 0	\$104,622	\$100,000	0	\$ 0	\$ 0	\$104,622
2	61		0	109,502	100,000	0	0	0	109,502
3	62		0	114,655	100,000	0	0	0	114,655
4	63		0	120,097	100,000	0	0	0	120,097
5	64		0	125,843	100,000	0	0	0	125,843
6	65		0	131,909	100,000	4.50%	4,500	5,663	131,909
7	66		0	138,316	100,000	4.50%	4,500	5,936	138,316
8	67		20,000	125,103	90,096	4.50%	4,500	6,224	125,103
9	68		5,630	125,595	90,096	4.50%	4,054	5,630	125,595
10	69		5,652	126,093	90,096	4.50%	4,054	5,652	126,093
11	70		6,305	125,965	90,096	5.00%	4,505	6,305	125,965
12	71		6,298	125,837	90,096	5.00%	4,505	6,298	125,837
13	72		6,292	125,707	90,096	5.00%	4,505	6,292	125,707
14	73		6,285	125,577	90,096	5.00%	4,505	6,285	125,577
15	74		6,279	125,447	90,096	5.00%	4,505	6,279	125,447
16	75		6,900	124,688	90,096	5.50%	4,955	6,900	124,688
17	76		6,858	123,929	90,096	5.50%	4,955	6,858	123,929

- The Income Base is established as the initial Purchase Payment.
- The Annual Income Amount and the Guaranteed Income Floor are calculated on the Income Eligibility Date.
- A withdrawal of \$20,000 is taken in year 8 at age 67. This withdrawal is after the Income Eligibility Date, triggering the income start date.
- This withdrawal is an excess withdrawal as it is greater than the Annual Income Amount of \$6,224.
- The excess withdrawal reduces the Income Base in direct proportion to the Contract Value reduction for the amount of the excess withdrawal \$13,776 (\$20,000 – \$6,224 = \$13,776). The Contract Value immediately prior to the \$20,000 withdrawal is \$145,319. The Income Base after the excess withdrawal is \$90,096 (\$100,000 x (\$145,319 – \$6,224 – \$13,776) / (\$145,319 – \$6,224) = \$90,096). The Guaranteed Income Floor is recalculated using the new Income Base.

Appendix O

MassMutual Lifetime Payment PlusSM Examples

Example 1 ~ Single Life – Setting Initial Values

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Initial Purchase Payment = \$100,000
- Guaranteed Lifetime Withdrawal Amount immediately applies as the covered person is age 60 on the Issue Date

Contract Year (beginning of year)	Age	Purchase Payment	Withdrawal	Contract Value	Credit	Available GLWA ⁽¹⁾	Benefit Base
1	60	\$100,000	\$0	\$100,000	\$0	\$5,000	\$100,000

(1) *Guaranteed Lifetime Withdrawal Amount.*

On the Issue Date, the initial values are set as follows:

- Benefit base = initial Purchase Payment = \$100,000.
- Guaranteed Lifetime Withdrawal Amount = 5% of benefit base = \$5,000.

Example 2 ~ Single Life – Credit

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Initial Purchase Payment = \$100,000
- Guaranteed Lifetime Withdrawal Amount immediately applies as the covered person is age 60 on the Issue Date

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	Credit	Available GLWA ⁽¹⁾	Benefit Base
1	60	\$100,000	\$0	\$105,001	\$6,000	\$5,300	\$106,000

(1) *Guaranteed Lifetime Withdrawal Amount reflects amount available to withdraw during the next Contract Year.*

- At the end of the first Contract Year, since there were no withdrawals, a credit of 6% of the initial benefit base is applied = \$6,000.
- Benefit base = initial benefit base plus credit = \$106,000.
- Guaranteed Lifetime Withdrawal Amount for Contract Year two = 5% of benefit base = \$5,300.

Example 3 ~ Single Life – Withdrawal of Guaranteed Lifetime Withdrawal Amount

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Initial Purchase Payment = \$100,000
- Guaranteed Lifetime Withdrawal Amount immediately applies as the covered person is age 60 on the Issue Date

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	Credit	Available GLWA ⁽¹⁾	Benefit Base
1	60	\$100,000	\$ 0	\$105,001	\$6,000	\$5,300	\$106,000
2	61		0	110,245	6,000	5,600	112,000
3	62		0	115,748	6,000	5,900	118,000
4	63		0	121,522	6,000	6,200	124,000
5	64		6,200	121,384	0	6,200	124,000

(1) *Guaranteed Lifetime Withdrawal Amount reflects amount available to withdraw during the next Contract Year.*

- Since there were no withdrawals during Contract Years one through four, at the end of each of those Contract Years, a credit of 6% of the initial benefit base is applied = \$6,000.
- The benefit base at the end of Contract Year four = \$124,000.
- Guaranteed Lifetime Withdrawal Amount for Contract Year five = 5% of benefit base (\$124,000) = \$6,200.
- A withdrawal of \$6,200 is taken in Contract Year five. A credit is not applied.
- The benefit base remains at \$124,000 as the withdrawal was not greater than the Guaranteed Lifetime Withdrawal Amount.

Example 4 ~ Single Life – Withdrawal Exceeding the Guaranteed Lifetime Withdrawal Amount

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Initial Purchase Payment = \$100,000
- Guaranteed Lifetime Withdrawal Amount immediately applies as the covered person is age 60 on the Issue Date

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	Credit	Available GLWA ⁽¹⁾	Benefit Base
1	60	\$100,000	\$ 0	\$105,001	\$6,000	\$5,300	\$106,000
2	61		0	110,245	6,000	5,600	112,000
3	62		0	115,748	6,000	5,900	118,000
4	63		0	121,522	6,000	6,200	124,000
5	64		0	127,584	6,000	6,500	130,000
6	65		0	133,949	6,000	6,800	136,000
7	66		0	140,635	6,000	7,100	142,000
8	67		15,000	132,673	0	6,644	132,872
9	68		0	139,307	7,972	7,042	140,845
10	69		0	146,263	7,972	7,441	148,817

(1) Guaranteed Lifetime Withdrawal Amount reflects amount available to withdraw during the next Contract Year.

- Since there were no withdrawals during Contract Years one through seven, at the end of each of those Contract Years, a credit of 6% of the initial benefit base is applied = \$6,000.
- The benefit base at the end of Contract Year seven = \$142,000.
- Guaranteed Lifetime Withdrawal Amount for Contract Year eight = 5% of benefit base (\$142,000) = \$7,100.
- A withdrawal of \$15,000 is taken in Contract Year eight. A credit is not applied.
- The withdrawal is greater than the Guaranteed Lifetime Withdrawal Amount (\$7,100). This results in an excess withdrawal \$15,000 – \$7,100 = \$7,900.
- Contract Value prior to the withdrawal = \$147,872.
- The benefit base is recalculated to equal to \$132,872 which is the lesser of the:
 - Contract Value after the excess withdrawal = \$147,872 – \$15,000 = \$132,872; or
 - benefit base prior to the withdrawal minus the excess withdrawal = \$142,000 – \$7,900 = \$134,100.
- The Guaranteed Lifetime Withdrawal Amount available for Contract Year nine = 5% of the new benefit base (\$140,845) = \$6,644.
- The Contract Value is reduced by the amount of the withdrawal including any applicable Contingent Deferred Sales Charges.

Example 5 ~ Single Life – Annual Ratchet

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Initial Purchase Payment = \$100,000
- Guaranteed Lifetime Withdrawal Amount immediately applies as the covered person is age 60 on the Issue Date

Contract Year (end of year)	Age	Purchase Payment	Withdrawal	Contract Value	Credit	Available GLWA ⁽¹⁾	Benefit Base
1	60	\$100,000	\$0	\$105,001	\$6,000	\$5,300	\$106,000
2	61			110,245	6,000	5,600	112,000
3	62			117,899	6,000	5,900	118,000
4	63			126,095	6,000	6,305	126,095

(1) *Guaranteed Lifetime Withdrawal Amount reflects amount available to withdraw during the next Contract Year.*

- At the end of Contract Years one through four, a credit of 6% of the initial benefit base (\$100,000) is applied, as withdrawals were not taken during this time period.
- The benefit base at the end of Contract Year four is set equal to the Contract Value of \$126,095 as it is greater than the benefit base plus the credit (\$118,000 + \$6,000 = \$124,000).
- The Guaranteed Lifetime Withdrawal Amount available for Contract Year five = 5% of the new benefit base (\$126,095) = \$6,305.

Example 6 ~ Single Life – Withdrawals Not Exceeding the Guaranteed Withdrawal Amount and Transitioned to Guaranteed Lifetime Withdrawal Amount

The values shown are based on the following assumptions:

- Owner Age at issue = 52
- Initial Purchase Payment = \$100,000
- Guaranteed Withdrawal Amount applies until the covered person is Age 60

Contract Year (end of year)	Age of Covered Person	Purchase Payment	Withdrawal	Contract Value	Credit	Available GWA/ GLWA ⁽¹⁾	Benefit Base
1	53	\$100,000	\$ 0	\$100,122	\$6,000	\$5,300	\$106,000
2	54		0	100,209	6,000	5,600	112,000
3	55		0	100,260	6,000	5,900	118,000
4	56		0	100,276	6,000	6,200	124,000
5	57		6,200	94,065	0	6,200	117,800
6	58		0	93,997	5,628	6,200	123,428
7	59		6,200	87,704	0	6,200	117,228
8	60		6,200	81,403	0	5,551	111,028

(1) *Guaranteed Withdrawal Amount / Guaranteed Lifetime Withdrawal Amount reflects amount available to withdraw during the next Contract Year.*

- At the end of Contract Years one through four, a credit of 6% of the initial benefit base (\$100,000) is applied, as withdrawals were not taken during this time period.
- Benefit base at the end of year four = \$124,000.
- The Guaranteed Withdrawal Amount for Contract Year five = 5% of benefit base (\$124,000) = \$6,200.
- A withdrawal of \$6,200 is taken at the end of Contract Year five, so a credit is not applied.
- The benefit base is reduced by the amount of the withdrawal, as the withdrawal is taken prior to attainment of age 60 of the covered person.
- The Guaranteed Withdrawal Amount remains at \$6,200, as the withdrawal was not greater than the Guaranteed Withdrawal Amount.
- The withdrawal in Contract Year eight is taken prior to attainment of age 60.
- At the end of Contract Year eight, the benefit base of \$111,028 locks in as the benefit base as the covered person is age 60. The Guaranteed Withdrawal Amount for Contract Year nine = 5% of benefit base (\$111,028) = \$5,551.

Example 7 ~ Single Life – Withdrawal Exceeding the Guaranteed Withdrawal Amount – Prior to Age 60

The values shown are based on the following assumptions:

- Owner Age at issue = 54
- Initial Purchase Payment = \$100,000
- Guaranteed Withdrawal Amount applies until the covered person is Age 60

Contract Year (end of year)	Age of Covered Person	Purchase Payment	Withdrawal	Contract Value	Credit	Available GWA/ GLWA ⁽¹⁾	Benefit Base
1	55	\$100,000	\$ 0	\$100,122	\$6,000	\$5,300	\$106,000
2	56		0	100,209	6,000	5,600	112,000
3	57		0	100,260	6,000	5,900	118,000
4	58		0	100,276	6,000	6,200	124,000
5	59		10,000	90,442	0	4,522	90,442

(1) *Guaranteed Withdrawal Amount / Guaranteed Lifetime Withdrawal Amount reflects amount available to withdraw during the next Contract Year.*

- Since there were no withdrawals during Contract Years one through four, at the end of each of those Contract Years, a credit of 6% of the initial benefit base is applied = \$6,000.
- The benefit base at the end of Contract Year four = \$124,000.
- Guaranteed Withdrawal Amount for Contract Year five = 5% of benefit base (\$124,000) = \$6,200.
- A withdrawal of \$10,000 is taken in Contract Year five. A credit is not applied.
- The Contract Value prior to the withdrawal = \$100,442.
- The withdrawal is greater than the Guaranteed Withdrawal Amount = \$6,200. This results in an excess withdrawal = \$10,000 – \$6,200 = \$3,800.
- The benefit base is recalculated to equal to \$90,442 which is the lesser of the: Contract Value after the excess withdrawal = \$100,442 – \$10,000 = \$90,442; or benefit base prior to the withdrawal minus the withdrawal = \$124,000 – \$10,000 = \$114,000.
- The Guaranteed Lifetime Withdrawal amount available for Contract Year six = 5% of the new benefit base (\$90,442) = \$4,522.
- The Contract Value is reduced by the amount of the withdrawal.

Example 8 ~ Single Life – Enhanced Benefit Base

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Initial Purchase Payment = \$100,000
- Guaranteed Lifetime Withdrawal Amount immediately applies as the covered person is age 60 on the Issue Date
- No withdrawals taken

Contract Year (end of year)	Age of Covered Person	Purchase Payment	Withdrawal	Contract Value	Credit	Available GLWA ⁽¹⁾	Benefit Base
1	61	\$100,000	\$0	\$105,001	\$6,000	\$ 5,300	\$106,000
2	62			110,245	6,000	5,600	112,000
3	63			115,748	6,000	5,900	118,000
4	64			121,522	6,000	6,200	124,000
5	65			127,584	6,000	6,500	130,000
6	66			133,949	6,000	6,800	136,000
7	67			140,635	6,000	7,100	142,000
8	68			147,659	6,000	7,400	148,000
9	69			155,041	6,000	7,752	155,041
10	70			162,795	9,302	10,000	200,000

(1) Guaranteed Lifetime Withdrawal Amount reflects amount available to withdraw during the next Contract Year.

- Since there were no withdrawals during Contract Years one through nine, at the end of each of those Contract Years, a credit of 6% of the initial benefit base is applied = \$6,000.
- At the end of Contract Year nine, an annual ratchet applies, as the Contract Value of \$155,041 is greater than the benefit base of \$154,000 (\$148,000 + \$6,000 = \$154,000).
- At the end of Contract Year ten, since there were no withdrawals, a credit of 6% of the last ratcheted benefit base (\$155,041) applies = 6% x \$155,041 = \$9,302.
- At the end of Contract Year ten, the benefit base = \$155,041 + \$9,302 = \$164,343.
- Since withdrawals were not taken during the first ten Contract Years, and the covered person has Attained Age 70, at the end of Contract Year ten, the benefit base is set equal to 200% of the initial Purchase Payment = \$200,000 as it is greater than \$164,343.
- Guaranteed Lifetime Withdrawal Amount for Contract Year eleven = 5% of new benefit base (\$200,000) = \$10,000.

Example 9 ~ Single Life – Additional Purchase Payments

The values shown are based on the following assumptions:

- Owner Age at issue = 60
- Initial Purchase Payment = \$100,000
- Guaranteed Lifetime Withdrawal Amount immediately applies as the covered person is age 60 on the Issue Date
- No withdrawals taken

Contract Year (end of year)	Age of Covered Person	Purchase Payment	Withdrawal	Contract Value	Credit	Available GLWA ⁽¹⁾	Benefit Base
1	61	\$100,000	\$0	\$105,001	\$ 6,000	\$ 5,300	\$106,000
2	62	25,000		136,496	7,500	6,925	138,500
3	63	25,000		169,559	9,000	8,625	172,500
4	64	25,000		204,271	10,500	10,400	208,000
5	65	0		214,463	10,500	10,925	218,500
6	66	0		225,163	10,500	11,450	229,000
7	67	0		236,399	10,500	11,975	239,500
8	68	0		248,202	10,500	12,500	250,000
9	69	0		258,310	10,500	13,025	260,500
10	70	0		268,828	10,500	13,750	275,000

(1) Guaranteed Lifetime Withdrawal Amount reflects amount available to withdraw during the next Contract Year.

- An additional Purchase Payment of \$25,000 is made at the beginning of Contract Years two, three and four.
- The benefit base is increased by the Purchase Payments.
- The credit increases in Contract Years two, three and four due to the additional Purchase Payments.
- At the end of Contract Year ten, since there were no withdrawals, a credit of 6% of the total Purchase Payment applies = $6\% \times \$175,000 = \$10,500$.
- At the end of Contract Year ten, the benefit base = $\$260,500 + \$10,500 = \$271,000$.
- Since withdrawals were not taken during the first ten Contract Years, and the covered person has Attained Age 70, at the end of Contract Year ten, the benefit base is set equal to 200% of Purchase Payments in the first Contract Year, as well as 100% of Purchase Payments made in Contract Years two through ten = $(\$100,000 \times 200\%) + (\$75,000 \times 100\%) = \$275,000$.
- The benefit base is set equal to \$275,000 as it is greater than \$271,000.
- Guaranteed Lifetime Withdrawal Amount for Contract Year eleven = 5% of new benefit base (\$275,000) = \$13,750

Appendix P

Equalizer Benefit Examples

Example 1 ~ Initial Benefit Period with No Withdrawals

The values shown are based on the following assumptions:

- Your Issue Date is 5/1/2005. This is the date when we credit your initial Purchase Payment of \$100,000 to your Contract.
- On 6/1/2005, an additional Purchase Payment of \$100,000 is made.
- On 4/30/2015, the initial benefit period ends.
- On 6/1/2015, an additional Purchase Payment of \$50,000 is made.
- On 4/30/2020, the subsequent benefit period ends.

Based on the above, we have the following values for the calculation of the Equalizer Benefit Credits

Date	Transaction	Contract Value Before Transaction	Purchase Payment or Withdrawal Amount	Total Purchase Payments in Benefit Period	Earnings ⁽¹⁾	Credit	Withdrawal Impact to Remaining Purchase Payments ⁽²⁾	Remaining Purchase Payments ⁽²⁾	Benefit Limit
5/1/2005	Purchase 1	\$ 0	\$100,000	\$100,000				\$100,000	\$40,000
6/1/2005	Purchase 2	100,500	100,000	200,000				200,000	80,000
4/30/2015	End of Benefit Period 1	341,000		200,000	\$141,000	\$14,100		200,000	80,000
6/1/2015	Purchase 3	357,000	50,000	50,000				250,000	100,000
4/30/2020	End of Benefit Period 2	529,000		50,000	123,900	12,390		250,000	100,000

(1) Earnings are the part of the Contract that are attributable to positive investment earnings in the Contract as of that day.

(2) "Withdrawal Impact to Remaining Purchase Payments" and "Remaining Purchase Payments" are only used to calculate the benefit limit and only subtracts the portion of a withdrawal that is greater than the difference between the Contract Value less any prior credits and the remaining Purchase Payments on that day.

- On the Issue Date, a \$100,000 Purchase Payment is made. The Equalizer Benefit Limit is equal to \$40,000 (\$100,000 x 40%).
- On 6/1/2005, a \$100,000 subsequent Purchase Payment is made, bringing the total Purchase Payments adjusted for withdrawals to \$200,000. The Equalizer Benefit limit is equal to \$80,000 (\$200,000 x 40%).
- At the end of the first benefit period, before any transactions, the Contract Value is \$341,000. The earnings are \$141,000 (\$341,000 – \$200,000) and the Equalizer Benefit is \$14,100 (\$141,000 x 10%). Because this number is less than the benefit limit of \$80,000, the full \$14,100 is credited.
- On 6/1/2015, a \$50,000 subsequent Purchase Payment is made, bringing the total Purchase Payments adjusted for withdrawals to \$250,000 (\$200,000+\$50,000). The Equalizer Benefit Limit is \$100,000 (\$250,000 x 40%).
- At the end of the second benefit period, before any transactions, the Contract Value is \$529,000. The earnings are \$123,900 (\$529,000 – \$341,000 – \$50,000 – \$14,100). The credit is the lesser of 10% of the earnings which is 12,390 (\$123,900 x 10%) and the benefit limit at the end of the period \$100,000; thus, the credit is \$12,390.

Example 2 ~ Impact of Withdrawal(s) on the Benefit Amount

This example is the same as Example 1 but has one withdrawal in each of the benefit periods.

- On 7/1/2008, a withdrawal of \$50,000 is disbursed from the Contract.
- On 7/1/2018, a withdrawal of \$100,000 is disbursed from the Contract.

Based on the above, we have the following values for the calculation of the Equalizer Benefit Credits

Date	Transaction	Contract Value Before Transaction	Purchase Payment or Withdrawal Amount	Total Purchase Payments in Benefit Period	Earnings ⁽¹⁾	Credit	Withdrawal Impact to Remaining Purchase Payments ⁽²⁾	Remaining Purchase Payments ⁽²⁾	Benefit Limit
5/1/2005	Purchase 1	\$ 0	\$100,000	\$100,000				\$100,000	\$40,000
6/1/2005	Purchase 2	100,500	100,000	200,000				200,000	80,000
7/1/2008	Pre-Withdrawal	236,500		200,000	36,500			200,000	80,000
7/1/2008	Withdrawal	236,500	\$50,000	200,000	0		13,500	186,500	74,600
4/30/2015	End of Benefit Period 1	269,000		200,000	119,000	11,900		186,500	74,600
6/1/2015	Purchase 3	282,000	50,000	50,000				236,500	94,600
7/1/2018	Pre-Withdrawal	391,000		50,000			0	236,500	94,600
7/1/2018	Withdrawal	391,000	100,000	50,000			0	236,500	94,600
4/30/2020	End of Benefit Period 2	322,000		50,000	91,100	9,110		236,500	94,600

(1) Earnings are the part of the Contract that are attributable to positive investment earnings in the Contract as of that day.

(2) "Withdrawal Impact to Remaining Purchase Payments" and "Remaining Purchase Payments" are only used to calculate the benefit limit and only subtracts the portion of a withdrawal that is greater than the difference between the Contract Value less prior credits and the remaining Purchase Payments on that day.

- On the Issue Date, a \$100,000 Purchase Payment is made. The Equalizer Benefit Limit is equal to \$40,000 (\$100,000 x 40%).
- On 6/1/2005, a \$100,000 subsequent Purchase Payment is made, bringing the total Purchase Payments adjusted for withdrawals to \$200,000. The Equalizer Benefit limit is equal to \$80,000 (\$200,000 x 40%).
- On 7/1/2008, a \$50,000 Withdrawal is made. The earnings pre-withdrawal is \$36,500 (\$236,500 – \$200,000). This withdrawal reduces the remaining Purchase Payments used to calculate the Equalizer benefit limit by \$13,500 (\$50,000 – \$36,500). The remaining Purchase Payments becomes \$186,500 (\$200,000-\$13,500). The resulting Equalizer Benefit Limit becomes \$74,600 (\$186,500 x 40%).
- At the end of the first benefit period, before any transactions, the Contract Value is \$269,000. The earnings are \$119,000 (\$269,000 – (\$200,000 – \$50,000)) and the Equalizer Benefit is \$11,900 (\$119,000 x 10%). Because this number is less than the benefit limit of \$74,600, the full \$11,900 is credited.
- On 6/1/2015, a \$50,000 subsequent Purchase Payment is made, bringing the total Purchase Payments adjusted for withdrawals to \$236,500 (\$186,500 + \$50,000). The Equalizer Benefit Limit is \$94,600 (\$236,500 x 40%).
- On 7/1/2018, a \$100,000 subsequent Withdrawal is made. The difference between the Contract Value and the remaining Purchase Payments is \$154,500 (\$391,000 – \$236,500). This withdrawal does not reduce the remaining Purchase Payments used to calculate the Equalizer benefit limit since the difference between the \$100,000 and \$154,500 is less than zero; thus, the withdrawal impact to remaining Purchase Payments is 0 and the remaining Purchase Payments remains at \$236,500.
- At the end of the second benefit period, before any transactions, the Contract Value is \$322,000. The earnings are \$91,100 (\$322,000 – \$269,000 – \$50,000 + \$100,000 – \$11,900). The credit is the lesser of 10% of the earnings which is \$9,110 (\$91,100x 10%) and the benefit limit at the end of the period \$94,600; thus, the credit is \$9,110.

Appendix Q

State Variations of Certain Contract Features

The following chart describes the material variation of certain features and/or benefits of the Contract in states where the Contract has been approved as of the date of the prospectus.

State	Feature	Variation
Connecticut	The Fixed Account and the Long-Term Guarantee Fixed Accounts	<p>The allocation of any Net Purchase Payment to The Fixed Account and the Long-Term Guarantee Fixed Account will be limited to a maximum of 20% of the total Net Purchase Payment.</p> <p>The Company will limit transfers from the Separate Account such that no transfer can cause The Fixed Account and the Long-Term Guarantee Fixed Account to exceed a maximum of 20% of the Contract Value.</p>
Florida	Annuity Provisions	Waives CDSC for transfer of Contract Value to Annuity Option.
	Annuity Period	Any full or partial annuitization cannot be earlier than thirteen months after the Issue Date.
	Fixed Account with Long Term Guarantee	Not available.
Massachusetts	Nursing Home Waiver Benefit	Not available.
	Fixed Account for Dollar Cost Averaging	Maximum DCA Term is 12 months.
Minnesota	Fixed Account with Long Term Guarantee	Not available.
Missouri	Fixed Account with Long Term Guarantee	Not available.
New Jersey	Purchase Payments	<p>For Contracts issued on or after May 1, 2010, the maximum amount of cumulative Purchase Payments is \$1.5 million.</p> <p>For Contracts issued prior to May 1, 2020, the maximum amount of cumulative Purchase Payments is \$1.5 million if the Owner was 75 or younger when we issued the Contract or \$500,000 if the Owner was older than age 75 or a non-natural person when we issued the Contract.</p>

State	Feature	Variation
New York	Annuity Payments	If any Annuity Payment is less than \$20, we reserve the right to change the payment basis to equivalent quarterly, semi-annual, or annual payments.
	Owner, Joint Owner, Annuitant	The Owner, Joint Owner, and the Annuitant may not be older than Age 85 on the Issue Date.
	Contract Termination	In order for the Company to terminate the Contract, no Purchase Payment may have been made for at least three consecutive years measured from the date of receipt of the last Purchase Payment.
	Annuity Period	Any full or partial annuitization cannot be earlier than thirteen months after the Issue Date.
	Fixed Account with Long Term Guarantee	Not available.
	Guaranteed Minimum Accumulation Benefit Rider	<p>A 26 year benefit period is available instead of a 20 year benefit.</p> <p>To elect the 26 year benefit, you must not have attained Age 64 at the time of election.</p> <p>To elect to 10 year benefit period, you must not have attained Age 80 at the time of election.</p> <p>The reset option under the 10 year benefit is not available once you reach Age 80.</p>
	GMIB 5/6	You may apply all or a minimum of \$10,000 of the GMIB value to a lifetime Annuity Option or a lifetime Annuity Option with period certain within the following guidelines: If your lifetime Annuity Option includes a period certain, the period certain cannot be greater than 15 years if the Annuitant is Age 65 or under; ten years if the Annuitant is at or between age 66 and 75; and five years if the Annuitant is at or between Age 76 and 90.
Oklahoma	Nursing Home Benefit Rider	If the Owner is not eligible for this benefit at the time of Contract issue, the Owner will become automatically eligible for this benefit upon two years following the date of discharge from a licensed nursing care facility.
	Owner, Joint Owner, Annuitant	The Owner, Joint Owner, and the Annuitant may not be older than Age 85 on the Issue Date.

State	Feature	Variation
Oregon	Annuity Guidelines	Waives CDSC for transfer of Contract Value to Annuity Option.
	Fixed Account with Long Term Guarantee	Not available.
	The Fixed Accounts	For Contracts issued after October 25, 2012, you may allocate up to 50% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts.
		For Contracts issued on or before October 25, 2012, you may allocate up to 70% of each Purchase Payment between The Fixed Account and the Long-Term Guarantee Fixed Accounts.
Pennsylvania	Fixed Account with Long Term Guarantee	For Contracts issued after October 25, 2012, we currently limit any transfer from the Funds such that no transfer can cause your combined value in The Fixed Account and the Long-Term Guarantee Fixed Accounts to exceed 50% of your total Contract Value.
		For Contracts issued on or before October 25, 2012, we currently limit any transfer from the Funds such that no transfer can cause your combined value in The Fixed Account and the Long-Term Guarantee Fixed Accounts to exceed 70% of your total Contract Value.
Texas	The Fixed Account and the Long-Term Guarantee Fixed Accounts	<p>The allocation of any Net Purchase Payment to The Fixed Account and the Long-Term Guarantee Fixed Account will be limited to a maximum of 20% of the total Net Purchase Payment.</p> <p>The Company will limit transfers from the Separate Account such that no transfer can cause The Fixed Account and the Long-Term Guarantee Fixed Account to exceed a maximum of 20% of the Contract Value.</p>
Washington	Fixed Account for Dollar Cost Averaging	Maximum DCA Term is 12 months.
	Fixed Account with Long Term Guarantee	Not available.

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The SAI contains additional information about the Separate Account. The SAI is incorporated into this prospectus by reference and it is legally part of this prospectus. We filed the SAI with the SEC. The SEC maintains a website (www.sec.gov) that contains the SAI, material incorporated by reference and other information regarding companies that file electronically with the SEC.

Reports and other information about the Separate Account, including the SAI, are available on the SEC website (www.sec.gov).

For a free copy of the SAI, other information about this Contract, or general inquiries, contact our Service Center:

MassMutual
Document Management Services – Annuities W360
PO Box 9067
Springfield, MA 01102-9067
(800) 272-2216
(Fax) (866) 329-4272
(Email) ANNfax@MassMutual.com
www.MassMutual.com

Investment Company Act file number: 811-08619
Securities Act file number: 333-112626
Class (Contract) Identifier: C000021315

STATEMENT OF ADDITIONAL INFORMATION

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY (Depositor)

MASSACHUSETTS MUTUAL VARIABLE ANNUITY SEPARATE ACCOUNT 4 (Registrant)

MASSMUTUAL TRANSITIONS SELECTSM

April 29, 2024

This is not a prospectus. This Statement of Additional Information (SAI) should be read in conjunction with the prospectus dated April 29, 2024, for the individual deferred variable annuity contract which is referred to herein.

For a copy of the prospectus, call (800) 272-2216, visit online at www.MassMutual.com/MMTransitionsSelect, send an email request to MassMutualServiceCenter@MassMutual.com, or write to MassMutual®, Document Management Services – Annuities W360, PO Box 9067, Springfield, MA 01102-9067.

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THE COMPANY

In this Statement of Additional Information, the “Company,” “we,” “us,” and “our” refer to Massachusetts Mutual Life Insurance Company (MassMutual). MassMutual and its domestic life insurance subsidiaries provide individual and group life insurance, disability insurance, individual and group annuities and guaranteed interest contracts to individual and institutional customers in all 50 states of the U.S., the District of Columbia and Puerto Rico. Products and services are offered primarily through MassMutual’s distribution channels: MassMutual Financial Advisors, MassMutual Strategic Distributors, Institutional Solutions and Worksite.

MassMutual was established on May 15, 1851 and is organized as a mutual life insurance company in the Commonwealth of Massachusetts. MassMutual’s home office is located at 1295 State Street, Springfield, Massachusetts 01111-0001.

THE SEPARATE ACCOUNT

We established Massachusetts Mutual Variable Annuity Separate Account 4 (Separate Account) as a separate account under Massachusetts law on July 9, 1997. The Separate Account is registered with the SEC as a unit investment trust under the 1940 Act.

The Separate Account holds the assets that underlie the Contracts (and certain other contracts that we issue), except any assets allocated to our General Account. We keep the Separate Account assets separate from the assets of our General Account and other separate accounts. The Separate Account is divided into Sub-Accounts, each of which invests exclusively in a single Fund.

We own the assets of the Separate Account. We credit gains to, or charge losses against, the Separate Account, whether or not realized, without regard to the performance of other investment accounts. The Separate Account’s assets may not be used to pay any of our liabilities other than those arising from the Contracts (or other contracts that we issue and that are funded by the Separate Account). If the Separate Account’s assets exceed the required reserves and other liabilities, we may transfer the excess to our General Account. The obligations of the Separate Account are not our generalized obligations and will be satisfied solely by the assets of the Separate Account. We are obligated to pay all amounts promised to investors under the Contract.

ASSIGNMENT OF CONTRACT

In certain states, the Contract cannot be assigned without MassMutual’s approval. MassMutual will refuse or accept any request to assign the Contract on a non-discriminatory basis. Please refer to your Contract.

MassMutual will not be charged with notice of any assignment of a contract or of the interest of any Beneficiary or of any other person unless the assignment is in writing and MassMutual receives the original or a true copy thereof at its Service Center. MassMutual assumes no responsibility for the validity of any assignment.

For qualified Contracts, the following exceptions and provisions should be noted:

- (1) No person entitled to receive Annuity Payments under a Contract or part or all of the Contract’s value will be permitted to commute, anticipate, encumber, alienate or assign such amounts, except upon the written authority of the Owner given during the Annuitant’s lifetime and received in Good Order by MassMutual at its Service Center. To the extent permitted by law, no Contract nor any proceeds or interest payable thereunder will be subject to the Annuitant’s or any other person’s debts, Contracts or engagements, nor to any levy or attachment for payment thereof;
- (2) If an assignment of a Contract is in effect on the maturity date, MassMutual reserves the right to pay to the assignee in one sum the amount of the Contract’s maturity value to which the assignee is entitled, and to pay any balance of such value in one sum to the Owner, regardless of any payment options which the Owner may have elected. Moreover, if an assignment of a contract is in effect at the death of the Annuitant prior to the maturity date, MassMutual will pay to the assignee in one sum the death benefit amount which corresponds to the death benefit choice in effect at the time of the Annuitant’s death. Any balance of such value will be paid to the Beneficiary in one sum or applied under one or more of the payment options elected;
- (3) Contracts used in connection with a tax-qualified retirement plan must be endorsed to provide that they may not be sold, assigned or pledged for any purpose unless they are owned by the trustee of a trust described in Internal Revenue Code of 1986, as amended (IRC), Section 401(a); and
- (4) Contracts issued under a plan for an Individual Retirement Annuity pursuant to IRC Section 408, or for a Roth Individual Retirement Annuity pursuant to IRC Section 408A, must be endorsed to provide that they are non-transferable. Such Contracts may not be sold, assigned, discounted, or pledged as collateral for a loan or as security for the performance of an obligation or for any other purpose by the Annuitant to any person or party other than MassMutual, except to a former spouse of the Annuitant in accordance with the terms of a divorce decree or other written instrument incident to a divorce.

Assignments may be subject to federal income tax.

DISTRIBUTION

We no longer offer the Contract for sale to the public. However, Owners may continue to make Purchase Payments to existing Contracts, subject to the limitations described in the prospectus.

Pursuant to separate underwriting agreements with the Company, on its own behalf and on behalf of the Separate Account, MML Investors Services, LLC (MMLIS), a subsidiary of MassMutual, serves as principal underwriter of the Contracts sold by its registered representatives, and MML Strategic Distributors, LLC (MSD), a subsidiary of MassMutual, serves as principal underwriter of the contracts sold by registered representatives of other broker-dealers who entered into distribution agreements with MSD.

MMLIS and MSD are located at 1295 State Street, Springfield, MA 01111-0001. MMLIS and MSD are registered with the SEC as broker-dealers under the Securities and Exchange Act of 1934 and are members of the Financial Industry Regulatory Authority (FINRA).

During the last three years, MMLIS and MSD were paid the compensation amounts shown below for their actions as principal underwriters for the Contracts described in the prospectus.

Year	MMLIS	MSD
2023	\$431,875	\$183,298
2022	\$456,266	\$107,662
2021	\$310,676	\$110,579

Commissions for sales of the Contracts by MMLIS registered representatives are paid by MassMutual on behalf of MMLIS to its registered representatives. Commissions for sales of the Contracts by registered representatives of other broker-dealers are paid by MassMutual on behalf of MSD to those broker-dealers.

During the last three years, commissions, as described in the prospectus, were paid by MassMutual through MMLIS and MSD as shown below.

Year	MMLIS	MSD
2023	\$2,024,013	\$1,083,882
2022	\$2,461,293	\$1,207,320
2021	\$3,574,362	\$1,510,626

The offering is on a continuous basis.

ACCUMULATION UNITS AND UNIT VALUE

During the Accumulation Phase, Accumulation Units shall be used to account for all amounts allocated to or withdrawn from the Sub-Accounts as a result of Purchase Payments, withdrawals, transfers, or fees and charges. MassMutual will determine the number of Accumulation Units of a Sub-Account purchased or canceled. This will be done by dividing the amount allocated to (or the amount withdrawn from) the Sub-Account by the dollar value of one Accumulation Unit of the Sub-Account as of the end of the Business Day during which the transaction is received at the Service Center.

The Accumulation Unit value for each Sub-Account was set on the date such Sub-Account became operative. Subsequent Accumulation Unit values for each Sub-Account are determined for each day in which the New York Stock Exchange is open for business (Business Day) by multiplying the Accumulation Unit value for the immediately preceding Business Day by the net investment factor for the Sub-Account for the current Business Day.

The net investment factor for each Sub-Account is determined by dividing A by B and subtracting C where:

A is (i) the net asset value per share of the funding vehicle or portfolio of a funding vehicle held by the Sub-Account for the current Business Day; plus (ii) any dividend per share declared on behalf of such funding vehicle or portfolio of a funding vehicle that has an ex-dividend date within the current Business Day; less (iii) the cumulative charge or credit for taxes reserved which is determined by MassMutual to have resulted from the operation or maintenance of the Sub-Account.

B is the net asset value per share of the funding vehicle or portfolio held by the Sub-Account for the immediately preceding Business Day, minus the cumulative charge or credit for taxes reserved which is determined by MassMutual to have resulted from the operation or maintenance of the Sub-Account as of the immediately preceding Business Day.

C is the cumulative charge since the immediately preceding Business Day for the insurance charges.

The Accumulation Unit value may increase or decrease from Business Day to Business Day.

TRANSFERS DURING THE INCOME PHASE

Transfers of annuity reserves between Sub-Accounts will be made by converting the number of annuity units attributable to the annuity reserves being transferred to the number of annuity units of the Sub-Account to which the transfer is made, so that the next annuity payment if it were made at that time would be the same amount that it would have been without the transfer. Thereafter, Annuity Payments will reflect changes in the value of the new annuity units.

The amount transferred to the General Account from a Sub-Account will be based on the annuity reserves for the Contract. Transfers to the General Account will be made by converting the annuity units being transferred to purchase Fixed Annuity Payments under the Annuity Option in effect and based on the age of the Annuitant at the time of the transfer.

See the "Transfers and Transfer Programs" section in the prospectus for more information about transfers during the Income Phase.

PAYMENT OF DEATH BENEFIT

MassMutual will require due proof of death before any death benefit is paid. Due proof of death will be:

- (1) a certified death certificate;
- (2) a certified decree of a court of competent jurisdiction as to the finding of death; or
- (3) any other proof satisfactory to MassMutual.

All death benefits will be paid in accordance with applicable law or regulations governing death benefit payments.

The Beneficiary designation in effect on the date we issue the Contract will remain in effect until changed. Unless the Owner provides otherwise, the death benefit will be paid in equal shares to the Beneficiary(ies) as follows:

- (1) to the primary Beneficiary(ies) who survive the Owner's and/or the Annuitant's death, as applicable; or
- (2) if there is no primary Beneficiary who survives the Owner's death and/or any Annuitant's death, as applicable, to the contingent Beneficiary(ies) who survive the Owner's and/or the Annuitant's death, as applicable; or
- (3) if there is no primary or contingent Beneficiary who survives the Owner's death and/or any Annuitant's death, as applicable, to the Owner or the Owner's estate.

You may name an irrevocable Beneficiary(ies). In that case, a change of Beneficiary requires the consent of any irrevocable Beneficiary. If an irrevocable Beneficiary is named, the Owner retains all other contractual rights.

See the "Death Benefit" section in the prospectus for more information on death benefits.

ANNUITY PAYMENTS

A variable annuity payment is an annuity with payments which;

- (1) are not predetermined as to dollar amount; and
- (2) will vary in amount with the net investment results of the applicable Sub-Accounts.

Annuity Payments also depend upon the age of the Annuitant and any joint Annuitant and the assumed interest factor utilized and may vary by gender of the Annuitant and any joint Annuitant. The annuity table used will depend upon the Annuity Option chosen. The dollar amount of Annuity Payments after the first is determined as follows:

- (1) The dollar amount of the first annuity payment is divided by the value of an annuity unit as of the Annuity Date. This establishes the number of annuity units for each annuity payment. The number of annuity units will remain the same for the life of the Contract unless you transfer among investment choices during the Income Phase or if you elected an Annuity Option with reduced payments to the survivor and the reduced payments to a survivor commence.
- (2) For each Sub-Account, the fixed number of annuity units is multiplied by the annuity unit value on each subsequent annuity payment date.
- (3) The total dollar amount of each variable annuity payment is the sum of all Sub-Account variable Annuity Payments.

The number of annuity units is determined as follows:

- (1) The number of annuity units credited in each Sub-Account will be determined by dividing the product of the portion of the Contract Value to be applied to the Sub-Account and the annuity purchase rate by the value of one annuity unit in that Sub-Account on the Annuity Date. The purchase rates are set forth in the variable annuity rate tables in the Contract.
- (2) For each Sub-Account, the amount of each annuity payment equals the product of the Annuitant's number of annuity units and the annuity unit value on the payment date. The amount of each payment may vary.

The value of any annuity unit for each Sub-Account was set on the date such Sub-Account became operative. The Sub-Account annuity unit value at the end of any subsequent valuation period is determined as follows:

- (1) The net investment factor for the current Business Day is multiplied by the value of the annuity unit for the Sub-Account for the immediately preceding Business Day.
- (2) The result in (1) is then divided by an assumed investment rate factor. The assumed investment rate factor equals 1.00 plus the assumed investment rate for the number of days since the preceding Business Day. The assumed investment rate is based on an effective annual rate of 4%.

The value of an annuity unit may increase or decrease from Business Day to Business Day. See the Income Phase section in the prospectus for more information.

EXPERTS

The financial statements of Massachusetts Mutual Variable Annuity Separate Account 4 as of December 31, 2023 and for each of the years in the two-year period then ended and the financial highlights for each of the years in the five-year period then ended and the statutory financial statements of Massachusetts Mutual Life Insurance Company (the Company) as of December 31, 2023 and 2022, and for each of the years in the three-year period ended December 31, 2023, each have been included in this Statement of Additional Information herein in reliance upon the reports of KPMG LLP, an independent registered public accounting firm, each of which are also included herein, and upon the authority of said firm as experts in accounting and auditing. KPMG LLP's report, dated February 27, 2024, states that the Company prepared its financial statements using statutory accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance (statutory accounting practices), which is a basis of accounting other than U.S. generally accepted accounting principles. Accordingly, KPMG LLP's report states that the financial statements of the Company are not intended to be and, therefore, are not presented fairly in accordance with U.S. generally accepted accounting principles and further states that those statements are presented fairly, in all material respects, in accordance with the statutory accounting practices. The principal business address of KPMG LLP is One Financial Plaza, 755 Main Street, Hartford, Connecticut 06103.

FINANCIAL STATEMENTS

The Registrant

Report of Independent Registered Public Accounting Firm

Statement of Assets and Liabilities as December 31, 2023

Statements of Operations and Changes in Net Assets for the years ended December 31, 2023 and 2022

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The Depositor

Independent Auditors' Report

Statutory Statement of Financial Position as of December 31, 2023 and 2022

Statutory Statements of Operations for the years ended December 31, 2023, 2022 and 2021

Statutory Statements of Change in Surplus for the years ended December 31, 2023, 2022 and 2021

Statutory Statements of Cash flows for the years ended December 31, 2023, 2022 and 2021

Notes to Statutory Financial Statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY

STATUTORY FINANCIAL STATEMENTS

As of December 31, 2023 and 2022 and
for the years ended December 31, 2023, 2022 and 2021

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY FINANCIAL STATEMENTS

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Independent Auditors' Report

Audit Committee of the Board of Directors
Massachusetts Mutual Life Insurance Company:

Opinions

We have audited the financial statements of Massachusetts Mutual Life Insurance Company (the Company), which comprise the statutory statements of financial position as of December 31, 2023 and 2022, and the related statutory statements of operations and changes in surplus, and cash flows for the three-year period ended December 31, 2023, and the related notes to the financial statements.

Unmodified Opinion on Statutory Basis of Accounting

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of the Company as of December 31, 2023 and 2022, and the results of its operations and its cash flows for the three-year period ended December 31, 2023 in accordance with accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance described in Note 2.

Adverse Opinion on U.S. Generally Accepted Accounting Principles

In our opinion, because of the significance of the matter discussed in the Basis for Adverse Opinion on U.S. Generally Accepted Accounting Principles section of our report, the financial statements do not present fairly, in accordance with U.S. generally accepted accounting principles, the financial position of the Company as of December 31, 2023 and 2022, or the results of its operations or its cash flows for the three-year period ended December 31, 2023.

Basis for Opinions

We conducted our audits in accordance with auditing standards generally accepted in the United States of America (GAAS). Our responsibilities under those standards are further described in the Auditors' Responsibilities for the Audit of the Financial Statements section of our report. We are required to be independent of the Company and to meet our other ethical responsibilities, in accordance with the relevant ethical requirements relating to our audits. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinions.

Basis for Adverse Opinion on U.S. Generally Accepted Accounting Principles

As described in Note 2 to the financial statements, the financial statements are prepared by the Company using accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance, which is a basis of accounting other than U.S. generally accepted accounting principles. Accordingly, the financial statements are not intended to be presented in accordance with U.S. generally accepted accounting principles. The effects on the financial statements of the variances between the statutory accounting practices described in Note 2 and U.S. generally accepted accounting principles, although not reasonably determinable, are presumed to be material and pervasive.

Emphasis of Matter

As discussed in Note 3 to the financial statements, in 2023, the Company adopted INT 23-01T - Disallowed IMR. Our opinions are not modified with respect to this matter.

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Responsibilities of Management for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance. Management is also responsible for the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is required to evaluate whether there are conditions or events, considered in the aggregate, that raise substantial doubt about the Company's ability to continue as a going concern for one year after the date that the financial statements are issued.

Auditors' Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditors' report that includes our opinion. Reasonable assurance is a high level of assurance but is not absolute assurance and therefore is not a guarantee that an audit conducted in accordance with GAAS will always detect a material misstatement when it exists. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control. Misstatements are considered material if there is a substantial likelihood that, individually or in the aggregate, they would influence the judgment made by a reasonable user based on the financial statements.

In performing an audit in accordance with GAAS, we:

- Exercise professional judgment and maintain professional skepticism throughout the audit.
- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, and design and perform audit procedures responsive to those risks. Such procedures include examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements.
- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control. Accordingly, no such opinion is expressed.
- Evaluate the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluate the overall presentation of the financial statements.
- Conclude whether, in our judgment, there are conditions or events, considered in the aggregate, that raise substantial doubt about the Company's ability to continue as a going concern for a reasonable period of time.



We are required to communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit, significant audit findings, and certain internal control related matters that we identified during the audit.

/s/ KPMG LLP

Hartford, Connecticut
February 27, 2024

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF FINANCIAL POSITION

	December 31, 2023	December 31, 2022
	(In Millions)	
Assets:		
Bonds	\$ 144,433	\$ 136,445
Preferred stocks	446	451
Common stocks – subsidiaries and affiliates	25,496	24,683
Common stocks – unaffiliated	1,623	1,477
Mortgage loans	24,021	24,972
Policy loans	15,897	17,054
Real estate	329	355
Partnerships and limited liability companies	12,907	12,296
Derivatives	20,740	22,032
Cash, cash equivalents and short-term investments	11,134	5,568
Other invested assets	2,401	1,865
Total invested assets	259,427	247,198
Investment income due and accrued	5,236	4,223
Federal income taxes	280	231
Net deferred income taxes	1,660	1,229
Other than invested assets	5,670	4,285
Total assets excluding separate accounts	272,273	257,166
Separate account assets	52,593	53,414
Total assets	\$ 324,866	\$ 310,580
Liabilities and Surplus:		
Policyholders' reserves	\$ 167,250	\$ 153,216
Liabilities for deposit-type contracts	19,645	18,089
Contract claims and other benefits	714	701
Policyholders' dividends	2,150	1,927
General expenses due or accrued	1,049	1,108
Asset valuation reserve	5,989	5,674
Repurchase agreements	3,219	3,042
Commercial paper	50	250
Collateral	2,073	4,065
Derivatives	13,734	14,003
Funds held under coinsurance	22,520	21,916
Other liabilities	5,141	5,364
Total liabilities excluding separate accounts	243,534	229,355
Separate account liabilities	52,455	53,284
Total liabilities	295,989	282,639
Surplus	28,877	27,941
Total liabilities and surplus	\$ 324,866	\$ 310,580

See accompanying notes to statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF OPERATIONS

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Revenue:			
Premium income	\$ 25,490	\$ 23,524	19,891
Net investment income	11,043	9,302	8,845
Fees and other income	1,028	1,139	1,253
Total revenue	37,561	33,965	29,989
Benefits, expenses and other deductions:			
Policyholders' benefits	17,369	16,937	11,513
Change in policyholders' reserves	12,273	10,278	11,649
General insurance expenses	2,333	2,191	2,269
Commissions	1,423	1,324	1,224
State taxes, licenses and fees	329	310	326
Other deductions	1,122	677	810
Total benefits, expenses and other deductions	34,849	31,717	27,791
Net gain from operations before dividends and federal income taxes	2,712	2,248	2,198
Dividends to policyholders	2,131	1,906	1,808
Net gain from operations before federal income taxes	581	342	390
Federal income tax expense (benefit)	116	(64)	72
Net gain from operations	465	406	318
Net realized capital (losses) gains	(490)	326	(534)
Net (loss) income	\$ (25)	\$ 732	(216)

See accompanying notes to statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF CHANGES IN SURPLUS

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Surplus, beginning of year	\$ 27,941	\$ 26,979	\$ 24,327
Net increase due to:			
Net (loss) income	(25)	732	(216)
Change in net unrealized capital gains (losses), net of tax	8	871	3,366
Change in net unrealized foreign exchange capital gains (losses), net of tax	376	(1,739)	(673)
Change in other net deferred income taxes	462	662	544
Change in nonadmitted assets	365	(563)	20
Change in asset valuation reserve	(315)	740	(1,209)
Change in reserve valuation basis	-	(12)	-
Change in surplus notes	(149)	413	841
Change in minimum pension liability	(7)	40	21
Prior period adjustments	173	(44)	31
Other	48	(138)	(73)
Net increase:	936	962	2,652
Surplus, end of year	\$ 28,877	\$ 27,941	\$ 26,979

See accompanying notes to statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
STATUTORY STATEMENTS OF CASH FLOWS

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Cash from operations:			
Premium and other income collected	\$ 26,418	\$ 24,719	\$ 20,237
Net investment income	12,269	8,172	9,238
Benefit payments	(17,077)	(16,698)	(11,349)
Net transfers from separate accounts	1,611	4,947	1,129
Commissions and other expenses	(5,208)	(5,292)	(4,557)
Dividends paid to policyholders	(1,908)	(1,806)	(1,688)
Federal and foreign income taxes recovered (paid)	58	5	(849)
Net cash from operations	16,163	14,047	12,161
Cash from investments:			
Proceeds from investments sold, matured or repaid:			
Bonds	23,801	28,498	37,911
Preferred and common stocks – unaffiliated	290	422	584
Common stocks – affiliated	105	72	45
Mortgage loans	3,621	3,784	4,889
Real estate	5	177	75
Partnerships and limited liability companies	1,830	2,910	1,629
Derivatives	(214)	(384)	(490)
Other	(518)	(655)	198
Total investment proceeds	28,920	34,824	44,841
Cost of investments acquired:			
Bonds	(32,278)	(43,003)	(47,343)
Preferred and common stocks – unaffiliated	(316)	(572)	(515)
Common stocks – affiliated	(256)	(624)	(3,966)
Mortgage loans	(2,896)	(2,095)	(5,170)
Real estate	(8)	(13)	(174)
Partnerships and limited liability companies	(2,988)	(3,932)	(4,033)
Derivatives	-	(267)	(66)
Other	153	11	86
Total investments acquired	(38,589)	(50,495)	(61,181)
Net increase in policy loans	1,158	(935)	(522)
Net cash used in investing activities	(8,511)	(16,606)	(16,862)
Cash from financing and miscellaneous sources:			
Net deposits on deposit-type contracts	1,238	806	2,359
Change in surplus notes	(150)	413	607
Change in repurchase agreements	171	241	(1,204)
Change in collateral	(2,024)	(2,089)	574
Other cash (used) provided	(1,321)	2,813	2,570
Net cash (used in) from financing and miscellaneous sources	(2,086)	2,184	4,906
Net change in cash, cash equivalents and short-term investments	5,566	(375)	205
Cash, cash equivalents and short-term investments:			
Beginning of year	5,568	5,943	5,738
End of year	\$ 11,134	\$ 5,568	\$ 5,943

See accompanying notes to statutory financial statements

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS

1. Nature of operations

Massachusetts Mutual Life Insurance Company (MassMutual or the Company), a mutual life insurance company domiciled in the Commonwealth of Massachusetts, and its domestic life insurance subsidiaries provide individual and group life insurance, disability insurance (DI), individual and group annuities and guaranteed interest contracts (GIC) to individual and institutional customers in all 50 states of the United States of America (U.S.), the District of Columbia and Puerto Rico. Products and services are offered primarily through the Company's MassMutual Financial Advisors (MMFA), MassMutual Strategic Distributors (MMSD), Institutional Solutions (IS) and Worksite distribution channels.

MMFA is a sales force of financial professionals that operate in the U.S. MMFA sells individual life, individual annuities, hybrid life and long-term care (LTC) and DI. The Company's MMSD channel sells life insurance, disability, annuity, and hybrid life and LTC solutions through a network of third-party distribution partners. The Company's IS distribution channel places group annuities, life insurance and GIC primarily through retirement advisory firms, actuarial consulting firms, investment banks, insurance benefit advisors and investment management companies. The Company's Worksite channel works with advisors and employers across the country to provide American workers with voluntary and executive benefits such as group whole life, critical illness, accident insurance and DI, through the workplace.

2. Summary of significant accounting policies

a. Basis of presentation

The statutory financial statements have been prepared in conformity with the statutory accounting practices of the National Association of Insurance Commissioners (NAIC) and the accounting practices prescribed or permitted by the Commonwealth of Massachusetts Division of Insurance (the Division).

Statutory accounting practices are different in some respects from financial statements prepared in accordance with U.S. generally accepted accounting principles (U.S. GAAP). The more significant differences between statutory accounting practices and U.S. GAAP are as follows:

Invested assets

- Bonds are generally carried at amortized cost, whereas U.S. GAAP reports bonds at fair value for bonds available for sale and trading or at amortized cost for bonds held to maturity (HTM)
- Changes in the fair value of derivative financial instruments are recorded as changes in surplus, whereas U.S. GAAP generally reports these changes in revenue unless deemed an effective hedge
- Interest rate and credit default swaps associated with replicated synthetic investment transactions are carried at amortized cost, whereas U.S. GAAP would carry them at fair value
- Embedded derivatives are recorded as part of the underlying contract, whereas U.S. GAAP would identify and bifurcate certain embedded derivatives from the underlying contract or security and account for them separately at fair value
- Income recognition on partnerships and limited liability companies, which are accounted for under the equity method, is limited to the amount of cash distribution, whereas U.S. GAAP is without limitation
- Certain majority-owned subsidiaries and variable interest entities are accounted for using the equity method, whereas U.S. GAAP would consolidate these entities
- Starting on January 1, 2022, the Company adopted the current expected credit loss (CECL) impairment model for U.S. GAAP, which only applies to financial assets carried at amortized cost, including mortgage and other commercial loans, equipment loans, HTM debt securities, and trade, lease, reinsurance and other receivables. CECL is based on expected credit losses rather than incurred losses. All financial assets within scope of CECL will have a credit loss allowance. The adopted guidance also changes the incurred loss model on AFS debt securities to be an allowance for credit losses with potential recoverability. Statutory accounting continues to utilize the other-than-temporary impairment(s) (OTTI) model described in *Note 2dd*.

Policyholders' liabilities

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

- Statutory policy reserves are generally based upon prescribed methods, such as the Commissioners' Reserve Valuation Method, Commissioners' Annuity Reserve Valuation Method or net level premium method, and prescribed statutory mortality, morbidity and interest assumptions at the time of issuance, whereas U.S. GAAP policy reserves would generally be based upon the net level premium method or the estimated gross margin method with estimates, at time of issuance, of future mortality, morbidity, persistency and interest
- Liabilities for policyholders' reserves, unearned premium, and unpaid claims are presented net of reinsurance ceded, whereas U.S. GAAP would present the liabilities on a direct basis and report an asset for the amounts recoverable or due from reinsurers
- Payments received for universal and variable life insurance products, certain variable and fixed deferred annuities and group annuity contracts are reported as premium income and corresponding change in reserves, whereas U.S. GAAP would treat these payments as deposits to policyholders' account balances

General insurance expenses and commissions

Certain acquisition costs, such as commissions and other variable costs, directly related to successfully acquiring new business are charged to current operations as incurred, whereas U.S. GAAP generally would capitalize these expenses and amortize them based on profit emergence over the expected life of the policies or over the premium payment period.

Net realized capital (losses) gains

- After-tax realized capital gains (losses) that result from changes in the overall level of interest rates for all types of fixed-income investments and interest-related hedging activities are deferred into the interest maintenance reserve (IMR) and amortized into revenue, whereas U.S. GAAP reports these gains and losses as revenue

Surplus

- Changes in the balances of deferred income taxes, which provide for book versus tax temporary differences, are subject to limitation and are recorded in surplus, whereas U.S. GAAP would generally include the change in deferred taxes in net income without limitation
- Assets are reported at admitted asset value and assets designated as nonadmitted are excluded through a charge against surplus, whereas U.S. GAAP recognizes all assets, net of any valuation allowances
- An asset valuation reserve (AVR) is reported as a contingency reserve to stabilize surplus against fluctuations in the statement value of real estate, partnerships and limited liability companies and certain common stocks as well as credit-related changes in the value of bonds, mortgage loans and certain derivatives, whereas U.S. GAAP does not record this reserve
- Changes to the mortgage loan valuation allowance are recognized in net unrealized capital gains (losses), net of tax, in the Consolidated Statutory Statements of Changes in Surplus, whereas U.S. GAAP follows the CECL impairment model effective 1/1/2022
- The overfunded status of pension and other postretirement plans, which is the excess of the fair value of the plan assets over the projected benefit obligation, is a nonadmitted asset for statutory accounting whereas U.S. GAAP recognizes the overfunded status as an asset
- Surplus notes are reported in surplus, whereas U.S. GAAP reports these notes as liabilities
- Statutory Statements of Changes in Surplus includes net income, change in net unrealized capital gains (losses), change in net unrealized foreign exchange capital gains (losses), change in other net deferred income taxes, change in nonadmitted assets, change in AVR, prior period adjustments and change in minimum pension liability, whereas U.S. GAAP presents net income as retained earnings and net unrealized capital gains (losses), change in net unrealized foreign exchange capital gains (losses), change in minimum pension liability as other comprehensive income
- The change in the fair value for unaffiliated common stock is recorded in surplus, whereas the change in the fair value for ownership interests in an entity not accounted for under the equity method or consolidated are recorded in revenue for U.S. GAAP

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Other

- Assets and liabilities associated with certain group annuity and variable universal life contracts, which do not pass-through all investment experience to contract holders, are maintained in separate accounts and are presented on a single line in the statutory financial statements, whereas U.S. GAAP reports these contracts as general investments and liabilities of the Company

The preparation of financial statements requires management to make estimates and assumptions that impact the reported amounts of assets and liabilities, the disclosure of assets and liabilities as of the date of the statutory financial statements and the reported amounts of revenues and expenses during the reporting periods. The most significant estimates and assumptions include those used in determining the carrying values of investments including the amount of mortgage loan investment valuation reserves, OTTI, the value of the investment in MassMutual Holding LLC (MMHLLC), the liabilities for policyholders' reserves, the determination of admissible deferred tax assets (DTA), the liability for taxes and the liability for litigation or other contingencies. Future events including, but not limited to, changes in the level of mortality, morbidity, interest rates, persistency, asset valuations and defaults could cause results to differ from the estimates used in the statutory financial statements. Although some variability is inherent in these estimates, management believes the amounts presented are appropriate.

Certain prior year amounts within these financial statements have been reclassified to conform to the current year presentation.

b. Corrections of errors and reclassifications

For the years ended December 31, 2023 and 2022, corrections of prior years' errors were recorded in surplus, net of tax:

	Years Ended December 31, 2023 and 2022					
	Increase (Decrease) to:					
	Prior Years' Net Income		Current Year Surplus		Asset or Liability Balances	
			(In Millions)			
	2023	2022	2023	2022	2023	2022
Common stocks -subsidiaries and affiliates	\$ 19	\$ -	\$ 19	\$ -	\$ 19	\$ -
Partnerships and limited liability companies	15	-	15	-	15	-
Derivative assets	-	-	(125)	-	(125)	-
Investment income due and accrued	230	-	230	-	230	-
Policyholders' reserves	(143)	(65)	(143)	(65)	143	65
Derivative liabilities	-	-	7	-	(7)	-
Other Liabilities	30	25	30	25	30	(25)
Other invested assets	22	-	22	-	22	-
Cash, cash equivalents and short-term investments	-	(4)	-	(4)	-	(4)
Total	\$ 173	\$ (44)	\$ 55	\$ (44)	\$	

c. Bonds

Bonds are generally valued at amortized cost using the constant yield interest method with the exception of NAIC

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Category 6 bonds, which are in or near default, and certain residential mortgage-backed securities (RMBS) and commercial mortgage-backed securities (CMBS), which are rated by outside modelers, which are carried at the lower of amortized cost or fair value. NAIC ratings are applied to bonds and other investments. Categories 1 and 2 are considered investment grade, while Categories 3 through 6 are considered below investment grade. Bonds are recorded on a trade date basis, except for private placement bonds, which are recorded on the funding date.

For loan-backed and structured securities, such as asset-backed securities (ABS), mortgage-backed securities (MBS), including RMBS and CMBS, and structured securities, including collateralized debt obligations (CDOs), amortization or accretion is revalued quarterly based on the current estimated cash flows, using either the prospective or retrospective adjustment methodologies.

Fixed income securities, with the highest ratings from a rating agency follow the retrospective method of accounting.

All other fixed income securities, such as floating rate bonds and interest only securities, including those that have been impaired, follow the prospective method of accounting.

The fair value of bonds is based on quoted market prices when available. If quoted market prices are not available, values provided by other third-party organizations are used. If values provided by other third-party organizations are unavailable, fair value is estimated using internal models by discounting expected future cash flows using observable current market rates applicable to yield, credit quality and maturity of the investment or using quoted market values for comparable investments. Internal inputs used in the determination of fair value include estimated prepayment speeds, default rates, discount rates and collateral values, among others. Structure characteristics and cash flow priority are also considered. Fair values resulting from internal models are those expected to be received in an orderly transaction between willing market participants.

Refer to *Note 2dd. "Net realized capital (losses) gains including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

d. Preferred stocks

Preferred stocks in good standing, those that are rated Categories 1 through 3 by the Securities Valuation Office (SVO) of the NAIC, are generally valued at amortized cost. Preferred stocks not in good standing, those that are rated Categories 4 through 6 by the SVO, are valued at the lower of amortized cost or fair value. Fair values are based on quoted market prices, when available. If quoted market prices are not available, values provided by third-party organizations are used. If values provided by third-party organizations are unavailable, fair value is estimated using internal models. These models use inputs not directly observable or correlated with observable market data. Typical inputs integrated into the Company's internal discounted expected earnings models include, but are not limited to, earnings before interest, taxes, depreciation and amortization estimates. Fair values resulting from internal models are those expected to be received in an orderly transaction between willing market participants.

Refer to *Note 2dd. "Net realized capital (losses) gains including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

e. Common stocks – subsidiaries and affiliates

On May 28, 2021, the Company, through a wholly owned subsidiary, Glidepath Holdings Inc. (Glidepath), acquired MassMutual Ascend Life Insurance Company (formerly known as Great American Life Insurance Company) and other subsidiaries and affiliated entities (MM Ascend) for \$3,570 million in cash. MM Ascend primarily offers traditional fixed and fixed indexed annuity products.

Common stocks of unconsolidated subsidiaries, primarily MMHLLC, Glidepath and MM Investment Holding (MMIH), are accounted for using the statutory equity method. The Company accounts for the value of MMHLLC at its underlying U.S. GAAP equity value less adjustments for the limited statutory basis of accounting related to foreign insurance subsidiaries and controlled affiliated entities as well as an adjustment of \$620 million as of December 31, 2023 for a portion of its noncontrolling interests (NCI). Glidepath is valued on it is underlying GAAP equity with adjustment to recognize its investment in MM Ascend based on MM Ascend's underlying statutory surplus, adjusted

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

for any unamortized goodwill that would have been recognized under the statutory purchase method. Operating results, less dividends declared, for MMHLLC, Glidepath and MMIH are reflected as net unrealized capital gains in the Statutory Statements of Changes in Surplus. Dividends declared from MMHLLC, Glidepath and MMIH are recorded in net investment income when declared and are limited to MMHLLC, Glidepath and MMIH's U.S. GAAP retained earnings. The cost basis of common stocks – subsidiaries and affiliates is adjusted for impairments deemed to be other than temporary.

Refer to *Note 5c. "Common stocks - subsidiaries and affiliates"* for further information on the valuation of MMHLLC.

f. Common stocks – unaffiliated

Unaffiliated common stocks are carried at fair value, which is based on quoted market prices when available. If quoted market prices are not available, values provided by third-party organizations are used. If values from third parties are unavailable, fair values are determined by management using estimates based upon internal models. The Company's internal models include estimates based upon comparable company analysis, review of financial statements, broker quotes and last traded price. Fair values resulting from internal models are those expected to be received in an orderly transaction between willing market participants.

Refer to *Note 2dd. "Net realized capital (losses) gains including other-than-temporary impairments and unrealized capital gains (losses)"* for information on the Company's policy for determining OTTI.

g. Mortgage loans

Mortgage loans are valued at the unpaid principal balance of the loan, net of unamortized premium, discount, mortgage origination fees and valuation allowances. Interest income earned on impaired loans is accrued on the outstanding principal balance of the loan based on the loan's contractual coupon rate. Interest is not accrued for (a) impaired loans more than 60 days past due, (b) delinquent loans more than 90 days past due, or (c) loans that have interest that is not expected to be collected. The Company continually monitors mortgage loans where the accrual of interest has been discontinued, and will resume the accrual of interest on a mortgage loan when the facts and circumstances of the borrower and property indicate that the payments will continue to be received according to the terms of the original or modified mortgage loan agreement.

h. Policy loans

Policy loans are carried at the outstanding loan balance less amounts unsecured by the cash surrender value of the policy and amounts ceded to reinsurers.

i. Real estate

Investment real estate, which the Company has the intent to hold for the production of income, and real estate occupied by the Company are carried at depreciated cost, less encumbrances. Depreciation is calculated using the straight-line method over the estimated useful life of the real estate holding, not to exceed 40 years. Depreciation expense is included in net investment income.

Real estate held for sale is initially carried at the lower of depreciated cost or fair value less estimated selling costs and is no longer depreciated. Adjustments to carrying value, including for further declines in fair value, are recorded in a valuation reserve, which is included in net realized capital (losses) gains.

Fair value is generally estimated using the present value of expected future cash flows discounted at a rate commensurate with the underlying risks, net of encumbrances. The Company also obtains external appraisals for a rotating selection of properties annually. If an external appraisal is not obtained, an internal appraisal is performed.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

j. Partnerships and limited liability companies

Partnerships and limited liability companies, except for partnerships that generate and realize low income housing tax credits (LIHTCs), are accounted for using the equity method with the change in the equity value of the underlying investment recorded in surplus. Distributions received are recognized as net investment income to the extent the distribution does not exceed previously recorded accumulated undistributed earnings.

Investments in partnerships that generate LIHTCs are carried at amortized cost unless considered impaired. Under the amortized cost method, the excess of the carrying value of the investment over its estimated residual value is amortized into net investment income during the period in which tax benefits are recognized.

The equity method is suspended if the carrying value of the investment is reduced to zero due to losses from the investment. Once the equity method is suspended, losses are not recorded until the investment returns to profitability and the equity method is resumed. However, if the Company has guaranteed obligations of the investment or is otherwise committed to provide further financial support for the investment, losses will continue to be reported up to the amount of those guaranteed obligations or commitments.

k. Derivatives

Interest rate swaps and credit default swaps associated with replicated assets are valued at amortized cost and all other derivative types are carried at fair value, which is based primarily upon quotations obtained from counterparties and independent sources. These quotations are compared to internally derived prices and a price challenge is lodged with the counterparties and independent sources when a significant difference cannot be explained by appropriate adjustments to the internal model. When quoted market values are not reliable or available, the value is based on an internal valuation process using market observable inputs that other market participants would use. Changes in the fair value of these instruments other than interest rate swaps and credit default swaps associated with replicated synthetic investments are recorded as unrealized capital gains (losses) in surplus. Gains and losses realized on settlement, termination, closing or assignment of contracts are recorded in net realized capital (losses) gains. Amounts receivable and payable are accrued as net investment income.

l. Cash, cash equivalents and short-term investments

Cash and cash equivalents, which are carried at amortized cost, consist of all highly liquid investments purchased with original maturities of three months or less.

Short-term investments, which are carried at amortized cost, consist of short-term bonds, money market mutual funds and all highly liquid investments purchased with maturities of greater than three months and less than or equal to 12 months.

The carrying value reported in the Statutory Statements of Financial Position for cash, cash equivalents and short-term investment instruments approximates the fair value.

m. Investment income due and accrued

Accrued investment income consists primarily of interest and dividends. Interest is recognized on an accrual basis and dividends are recorded as earned on the ex-dividend date.

n. Federal income taxes

Total federal income taxes are based upon the Company's best estimate of its current and DTAs or deferred tax assets or liabilities. Current tax expense (benefit) is reported in the Statutory Statements of Operations as federal income tax expense (benefit) if resulting from operations and within net realized capital (losses) gains if resulting from invested asset transactions. Changes in the balances of net deferred taxes, which provide for book-to-tax temporary differences, are subject to limitations and are reported within various lines within surplus. Accordingly, the reporting of book-to-tax temporary differences, such as reserves and policy acquisition costs, and of book-to-tax permanent differences, such as tax-exempt interest and tax credits, may result in effective tax rates in the Statutory Statements of Operations that differ from the federal statutory tax rate.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

o. Other than invested assets

Other than invested assets primarily includes the Company's investment in corporate-owned life insurance, deferred and uncollected life insurance premium, receivable from subsidiaries and affiliates, reinsurance recoverable, fixed assets and other receivables.

p. Separate accounts

Separate accounts and sub-accounts are segregated funds administered and invested by the Company, the performance of which primarily benefits the policyholders/contract holders with an interest in the separate accounts. Group and individual variable annuity, variable life and other insurance policyholders/contract holders select from among the separate accounts and sub-accounts made available by the Company. The separate accounts and sub-accounts are offered as investment options under certain insurance contracts or policies. The returns produced by separate account assets increase or decrease separate account reserves. Separate account assets consist principally of marketable securities reported at fair value. Except for the Company's seed money, supplemental accounts and certain guaranteed separate accounts issued in Minnesota, separate account assets can only be used to satisfy separate account liabilities and are not available to satisfy the general obligations of the Company. Separate account administrative and investment advisory fees are included in fees and other income.

Assets may be transferred from the general investments of the Company to seed the separate accounts. When assets are transferred, they are transferred at fair market value. Gains related to the transfer are deferred to the extent that the Company maintains a proportionate interest in the separate account. The deferred gain is recognized as the Company's ownership decreases or when the underlying assets are sold. Losses associated with these transfers are recognized immediately.

Separate accounts reflect two categories of risk assumption: nonguaranteed separate accounts for which the policyholder/contract holder assumes the investment risk and guaranteed separate accounts for which the Company contractually guarantees a minimum return, a minimum account value, or both to the policyholder/contract holder. For certain guaranteed separate account products such as interest rate guaranteed products and indexed separate account products, reserve adequacy is performed on a contract-by-contract basis using, as applicable, prescribed interest rates, mortality rates and asset risk deductions. If the outcome from this adequacy analysis produces a deficiency relative to the current account value, a liability is recorded in policyholders' reserves or liabilities for deposit-type contracts in the Statutory Statements of Financial Position with the corresponding change in the liability recorded as change in policyholders' reserves or policyholders' benefits in the Statutory Statements of Operations.

Premium income, benefits and expenses of the separate accounts are included in the Statutory Statements of Operations with the offset recorded in the change in policyholders' reserves. Investment income, realized capital gains (losses) and unrealized capital gains (losses) on the assets of separate accounts, other than seed money, accrue to policyholders/contract holders and are not recorded in the Statutory Statements of Operations.

q. Nonadmitted assets

Assets designated as nonadmitted by the NAIC primarily include pension plan assets, intangibles, certain electronic data processing equipment, advances and prepayments, certain investments in partnerships and limited liability companies for which qualifying audits are not performed, the amount of DTAs (subject to certain limitations) that will not be realized by the end of the third calendar year following the current year end, furniture and equipment, certain other receivables and uncollected premium greater than 90 days past due. Due and accrued income is nonadmitted on: (a) bonds delinquent more than 90 days or where collection of interest is improbable; (b) impaired bonds more than 60 days past due; (c) bonds in default; (d) mortgage loans in default where interest is 180 days past due; (e) rent in arrears for more than 90 days; and (f) policy loan interest due and accrued more than 90 days past due and included in the unpaid balance of the policy loan in excess of the cash surrender value of the underlying contract. Assets that are designated as nonadmitted are excluded from the Statutory Statements of Financial Position through a change in nonadmitted assets on the Statutory Statements of Changes in Surplus.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

r. Reinsurance

The Company enters into reinsurance agreements with affiliated and unaffiliated insurers in the normal course of business to limit its insurance risk or to assume business.

Premium income, policyholders' benefits (including unpaid claims) and policyholders' reserves are reported net of reinsurance. Premium, benefits and reserves related to reinsured business are accounted for on bases consistent with those used in accounting for the original policies issued and the terms of the reinsurance contracts. The Company records a receivable for reinsured benefits paid, but not yet reimbursed by the reinsurer and reduces policyholders' reserves for the portion of insurance liabilities that are reinsured. Commissions and expense allowances on reinsurance ceded and modified coinsurance (Modco) reserve adjustments on reinsurance ceded are recorded as revenue. Commissions and expense allowances on Retirement Plan Group reinsurance assumed and Modco reserve adjustments on reinsurance assumed are recorded as an expense.

s. Policyholders' reserves

Policyholders' reserves are developed by actuarial methods that will provide for the present value of estimated future obligations in excess of estimated future premium on policies in force and are determined based on either statutory prescribed mortality/morbidity tables using specified interest rates and valuation methods, or principles-based reserving under Valuation Manual -20 which considers a wide range of future economic conditions, computed using justified company experience factors, such as mortality, policyholder behavior and expenses.

The Company waives deduction of deferred fractional premium at death and returns any portion of the final premium beyond the date of death. Reserves are computed using continuous functions to reflect these practices.

The Company charges a higher premium on certain contracts that cover substandard mortality risk. For these policies, the reserve calculations are based on a substandard mortality rate, which is a multiple of the standard mortality tables.

Certain variable universal life and universal life contracts include features such as guaranteed minimum death benefits (GMDB) or other guarantees that ensure continued death benefit coverage when the policy would otherwise lapse. The value of the guarantee is only available to the beneficiary in the form of a death benefit. The liability for variable and universal life GMDBs and other guarantees is included in policyholders' reserves and the related change in this liability is included in change in policyholders' reserves in the Statutory Statements of Operations.

Certain individual variable annuity and fixed annuity products have a variety of additional guarantees such as GMDBs and variable annuity guaranteed living benefits (VAGLB). The primary types of VAGLBs include guaranteed minimum accumulation benefits (GMAB), guaranteed minimum income benefits (GMIB) including GMIB Basic and GMIB Plus and guaranteed lifetime withdrawal benefits (GLWB). In general, these benefit guarantees require the contract owner or policyholder to adhere to a company-approved asset allocation strategy. The liabilities for individual variable annuity GMDBs and VAGLBs are included in policyholders' reserves in the Statements of Financial Position and the related changes in these liabilities are included in change in policyholders' reserves in the Statutory Statements of Operations.

Separate accounts include certain group annuity contracts used to fund retirement plans that offer a guarantee of a contract holder's principal, which can be withdrawn over a stated period of time. These contracts offer a stated rate of return backed by the Company. Contract payments are not contingent upon the life of the retirement plan participants.

Unpaid claims and claim expense reserves are related to disability and LTC claims. Unpaid disability claim liabilities are projected based on the average of the last three disability payments. LTC unpaid claim liabilities are projected using policy specific daily benefit amounts and aggregate utilization factors. Claim expense reserves are based on an analysis of the unit expenses related to the processing and examination of new and ongoing claims. Interest accrued on reserves is calculated by applying NAIC prescribed interest rates to the average reserves by year incurred.

Tabular interest, tabular reserves, reserves released, and tabular cost for all life and annuity contracts and supplementary contracts involving life contingencies are determined in accordance with NAIC Annual Statement instructions. For tabular interest, whole life and term products use a formula that applies a weighted average interest

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

rate determined from a seriatim valuation file to the mean average reserves. Universal life, variable life, group life, annuity and supplemental contracts use a formula that applies a weighted average credited rate to the mean account value. For contracts without an account value (e.g., a Single Premium Immediate Annuity) a weighted average statutory valuation rate is applied to the mean statutory reserve or accepted actuarial methods using applicable interest rates are applied.

All policyholders' reserves and accruals are presented net of reinsurance. Management believes that these liabilities and accruals represent management's best estimate and will be sufficient, in conjunction with future revenues, to meet future anticipated obligations of policies and contracts in force.

t. Liabilities for deposit-type contracts

Liabilities for funding agreements, dividend accumulations, premium deposit funds, investment-type contracts such as supplementary contracts not involving life contingencies and certain structured settlement annuities are based on account value or accepted actuarial methods using applicable interest rates.

u. Participating contracts

Participating contracts are those that may be eligible to share in any dividends declared by the Company. Participating contracts issued by the Company represented 53% of the Company's policyholders' reserves and liabilities for deposit-type contracts as of December 31, 2023 and 56% as of December 31, 2022.

v. Policyholders' dividends

Dividends expected to be paid to policyholders in the following year are approved annually by MassMutual's Board of Directors and are recorded as an expense in the current year. The allocation of these dividends to policyholders reflects the relative contribution of each group of participating policies to surplus and considers, among other factors, investment returns, mortality and morbidity experience, expenses and taxes. The liability for policyholders' dividends includes the estimated amount of annual dividends and settlement dividends. A settlement dividend is an extra dividend payable at termination of a policy upon maturity, death or surrender.

w. Asset valuation reserve

The Company maintains an AVR that is a contingency reserve to stabilize surplus against fluctuations in the carrying value of common stocks, real estate, partnerships and limited liability companies as well as credit-related changes in the value of bonds, preferred stocks, mortgage loans, and certain derivatives. The AVR is reported as a liability within the Statutory Statements of Financial Position and the change in AVR, net of tax, is reported within the Statutory Statements of Changes in Surplus.

x. Repurchase agreements

Repurchase agreements are contracts under which the Company sells securities and simultaneously agrees to repurchase the same or substantially the same securities. These repurchase agreements are carried at cost and accounted for as collateralized borrowings with the proceeds from the sale of the securities recorded as a liability while the underlying securities continue to be recorded as an investment by the Company. Earnings on these investments are recorded as investment income and the difference between the proceeds and the amount at which the securities will be subsequently reacquired is amortized as interest expense. Repurchase agreements are used as a tool for overall portfolio management to help ensure the Company maintains adequate assets in order to provide yield, spread and duration to support liabilities and other corporate needs.

The Company provides collateral, as dictated by the repurchase agreements, to the counterparty in exchange for a loan. If the fair value of the securities sold becomes less than the loan, the counterparty may require additional collateral.

The carrying value reported in the Statutory Statements of Financial Position for repurchase agreements approximates the fair value.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

y. Commercial paper

The Company issues commercial paper (CP) in the form of unsecured notes. Interest on CP is calculated using a 360-day year based on the actual number of days elapsed. Due to the short-term nature of CP, the carrying value approximates fair value.

z. Interest maintenance reserve

The Company maintains an IMR that is used to stabilize net income against fluctuations in interest rates. After-tax realized capital gains (losses), which result from changes in interest rates for all types of fixed-income investments and interest-related derivatives, are deferred into the IMR and amortized into net investment income using the grouped amortization method. In the grouped amortization method, assets are grouped based on years of maturity. IMR is reduced by the amount ceded to reinsurers when entering into in force coinsurance ceding agreements. The IMR is included as net negative (Disallowed) IMR for any admitted portion in other than invested assets. Refer to *Note 3. "New accounting standards - Adoption of new accounting standards"* for further information on the adoption of INT 23-OIT - Disallowed IMR. Refer to *Note 7. "Other than invested assets"* for further information on the amount admitted as disallowed IMR.

aa. Employee compensation plans

The Company has a long-term incentive compensation plan, under which certain employees of the Company and its subsidiaries may be issued phantom share-based compensation awards. These awards include Phantom Stock Appreciation Rights (PSARs) and Phantom Restricted Stock (PRS). These awards do not grant an equity or ownership interest in the Company.

PSARs provide the participant with the opportunity to share in the value created in the total enterprise. The PSAR value is the appreciation in the phantom stock price between the grant price and the share price at the time of exercise. Awards can only be settled in cash. PSARs typically cliff vest at the end of three years and expire five years after the date of grant. Vested PSARs may be exercised during quarterly two-week exercise periods prior to expiration. The compensation expense for an individual award is recognized over the service period.

PRS provide the participant with the opportunity to share in the value created in the total enterprise. Participants receive the full phantom share value (grant price plus/minus any change in share price) over the award period. Awards can only be settled in cash. PRS typically vests on a graded basis over five years, one third per year after years three, four and five. On each vesting date, a lump sum cash settlement is paid to the participant based on the number of shares vested multiplied by the most recent phantom stock price. Compensation expense is recognized on the accelerated attribution method. The accelerated attribution method recognizes compensation expense over the vesting period by which each separate payout year is treated as if it were, in substance, a separate award.

All awards granted under the Company's plans are compensatory classified awards. Compensation costs are based on the most recent quarterly calculated intrinsic value of the PSARs (current share price less grant price per share not less than zero) and PRS (current share price per share), considering vesting provisions, net of forfeiture assumptions and are included in the Statutory Statements of Financial Position as a liability in general expenses due or accrued. The compensation expense for an individual award is recognized over the service period. The cumulative compensation expense for all outstanding awards in any period is equal to the change in calculated liability period over period. The requisite service period for the awards is the vesting period.

At the time of death or disability, awards contain vesting conditions, whereby employees' unvested awards immediately vest on an accelerated basis with a one-year exercise period for PSARs, full accelerated vesting and settlement for PRS awards.

At the time of retirement, both PRS and PSAR vest according to the original grant terms.

The phantom share price is determined using the enterprise value of each entity within the organization provided it is within a pre-established range calculated using management basis equity method. If outside the range, the maximum or minimum share price established by the management basis equity method would apply, as appropriate.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

bb. Other liabilities

Other liabilities primarily consist of the derivative interest expense liability, remittances and items not allocated, other miscellaneous liabilities, liabilities for employee benefits and accrued separate account transfers.

cc. Premium and related expense recognition

Life insurance premium revenue is generally recognized annually on the anniversary date of the policy. However, premium for flexible products, primarily universal life and variable universal life contracts, is recognized as revenue when received. Annuity premium is recognized as revenue when received. DI and LTC premium is recognized as revenue when due.

Premium revenue is adjusted by the related deferred premium adjustment. Deferred premium adjusts for the overstatement created in the calculation of reserves as the reserve computation assumes the entire year's net premium is collected annually at the beginning of the policy year and does not take into account installment or modal payments.

Commissions and other costs related to issuance of new policies and policy maintenance and settlement costs are charged to current operations when incurred. Surrender fee charges on certain life and annuity products are recorded as a reduction of benefits and expenses.

dd. Net realized capital (losses) gains including other-than-temporary impairments and unrealized capital gains (losses)

Net realized capital (losses) gains, net of taxes, exclude gains (losses) deferred into the IMR and gains (losses) of the separate accounts. Net realized capital (losses) gains, including OTTI, are recognized in net income and are determined using the specific identification method.

Bonds - general

The Company employs a systematic methodology to evaluate OTTI by conducting a quarterly analysis of bonds. OTTI is evaluated in a manner consistent with market participant assumptions. The Company considers the following factors, where applicable depending on the type of securities, in the evaluation of whether a decline in value is other than temporary: (a) the likelihood that the Company will be able to collect all amounts due according to the contractual terms of the debt security; (b) the present value of the expected future cash flows of the security; (c) the characteristics, quality and value of the underlying collateral or issuer securing the position; (d) collateral structure; (e) the length of time and extent to which the fair value has been below amortized cost; (f) the financial condition and near-term prospects of the issuer; (g) adverse conditions related to the security or industry; (h) the rating of the security; (i) the Company's ability and intent to hold the investment for a period of time sufficient to allow for an anticipated recovery to amortized cost; and (j) other qualitative and quantitative factors in determining the existence of OTTI including, but not limited to, unrealized loss trend analysis and significant short-term changes in value.

In addition, if the Company has the intent to sell, or the inability, or lack of intent to retain the investment for a period sufficient to recover the amortized cost basis, an OTTI is recognized as a realized loss equal to the entire difference between the investment's amortized cost basis and its fair value at the balance sheet date.

When a bond is other-than-temporarily impaired, a new cost basis is established.

Bonds - corporate

For corporate securities, if it is determined that a decline in the fair value of a bond is other than temporary, OTTI is recognized as a realized loss equal to the difference between the investment's amortized cost basis and, generally, its fair value at the balance sheet date.

The Company analyzes investments whose fair value is below the cost for impairment. Generally, if the investment experiences significant credit or interest rate related deterioration, the cost of the investment is not recoverable, or the Company intends to sell the investment before anticipated recovery, an OTTI is recognized as realized investment loss.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Bonds - loan-backed and structured securities

For loan-backed and structured securities, if the present value of cash flows expected to be collected is less than the amortized cost basis of the security, an OTTI is recognized as a realized loss equal to the difference between the investment's amortized cost basis and the present value of cash flows expected to be collected. The expected cash flows are discounted at the security's effective interest rate. Internal inputs used in determining the amount of the OTTI on structured securities include collateral performance, prepayment speeds, default rates, and loss severity based on borrower and loan characteristics, as well as deal structure including subordination, over-collateralization and cash flow priority.

ABS and MBS are evaluated for OTTI using scenarios and assumptions based on the specifics of each security including collateral type, loan type, vintage and subordination level in the structure. Cash flow estimates are based on these assumptions and inputs obtained from external industry sources along with internal analysis and actual experience. Where applicable, assumptions include prepayment speeds, default rates and loss severity, weighted average maturity and changes in the underlying collateral values.

The Company has a review process for determining if CDOs are at risk for OTTI. For the senior, mezzanine and junior debt tranches, cash flows are modeled using multiple scenarios based on the current ratings and values of the underlying corporate credit risks and incorporating prepayment and default assumptions that vary according to collateral attributes of each CDO. The prepayment and default assumptions are varied within each model based upon rating (base case), historical expectations (default), rating change improvement (optimistic), rating change downgrade (pessimistic) and fair value (market). The default rates produced by these multiple scenarios are assigned an expectation weight according to current market and economic conditions and fed into a final scenario. OTTI is recorded if this final scenario results in the loss of any principal or interest payments due.

For the most subordinated junior CDO tranches, the present value of the projected cash flows in the final scenario is measured using an effective yield. If the current book value of the security is greater than the present value measured using an effective yield, an OTTI is taken in an amount sufficient to produce its effective yield. Certain CDOs cannot be modeled using all of the scenarios because of limitations on the data needed for all scenarios. The cash flows for these CDOs, including foreign currency denominated CDOs, are projected using a customized scenario management believes is reasonable for the applicable collateral pool.

For loan-backed and structured securities, any difference between the new amortized cost basis and any increased present value of future cash flows expected to be collected is accreted into net investment income over the expected remaining life of the bond.

Common and preferred stock

The cost basis of common and preferred stocks is adjusted for impairments deemed to be other than temporary. The Company considers the following factors in the evaluation of whether a decline in value is other than temporary: (a) the financial condition and near-term prospects of the issuer; (b) the Company's ability and intent to retain the investment for a period sufficient to allow for a near-term recovery in value; and (c) the period and degree to which the value has been below cost. The Company conducts a quarterly analysis of issuers whose common or preferred stock is not-in-good standing or valued below 80% of cost. The Company also considers other qualitative and quantitative factors in determining the existence of OTTI including, but not limited to, unrealized loss trend analysis and significant short-term changes in value.

Mortgage loans

The Company performs internal reviews at least annually to determine if individual mortgage loans are performing or nonperforming. The fair values of performing mortgage loans are estimated by discounting expected future cash flows using current interest rates for similar loans with similar credit risk. For nonperforming loans, the fair value is the estimated collateral value of the underlying real estate. If foreclosure is probable, the Company will obtain an external appraisal.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Mortgage loans are considered to be impaired when, based upon current available information and events, it is probable that the Company will be unable to collect all amounts of principal and interest due according to the contractual terms of the mortgage loan agreement. A valuation allowance is recorded on a loan-by-loan basis in net unrealized capital losses for the excess of the carrying value of the mortgage loan over the fair value of its underlying collateral. Such information or events could include property performance, capital budgets, future lease roll, a property inspection as well as payment trends. Collectability and estimated decreases in collateral values are also assessed on a loan-by-loan basis considering all events and conditions relevant to the loan. This evaluation is inherently subjective as it requires estimates that are susceptible to significant revisions as more information becomes available, as changes occur in the market or as negotiations with the borrowing entity evolve. If there is a change in the fair value of the underlying collateral or the estimated loss on the loan, the valuation allowance is adjusted accordingly. An OTTI occurs upon the realization of a credit loss, typically through foreclosure or after a decision is made to accept a discounted payoff, and is recognized in realized capital losses. The previously recorded valuation allowance is reversed from unrealized capital losses. When an OTTI is recorded, a new cost basis is established reflecting estimated value of the collateral.

Real estate

For real estate held for the production of income, depreciated cost is adjusted for impairments whenever events or changes in circumstances indicate the carrying amount of the asset may not be recoverable, with the impairment being included in realized capital losses. An impairment is recorded when the property's estimated future net operating cash flows over ten years, undiscounted and without interest charges, is less than book value.

Adjustments to the carrying value of real estate held for sale are recorded in a valuation reserve as realized capital losses when the fair value less estimated selling costs is less than the carrying value.

Partnerships and limited liability companies

When it is probable that the Company will be unable to recover the outstanding carrying value of an investment based on undiscounted cash flows, or there is evidence indicating an inability of the investee to sustain earnings to justify the carrying value of the investment, OTTI is recognized in realized capital losses reflecting the excess of the carrying value over the estimated fair value of the investment. The estimated fair values of limited partnership interests are generally based on the Company's share of the net asset value (NAV) as provided in the financial statements of the investees. In certain circumstances, management may adjust the NAV by a premium or discount when it has sufficient evidence to support applying such adjustments.

For determining impairments in partnerships that generate LIHTCs, the Company uses the present value of all future benefits, the majority of which are tax credits, discounted at a risk-free rate for future benefits of ten or more years and compares the results to its current book value. Impairments are recognized in realized capital losses reflecting the excess of the carrying value over the estimated fair value of the investment.

Unrealized capital gains (losses)

Unrealized capital gains (losses) include changes in the fair value of derivatives, excluding interest rate swaps and credit default index swaps associated with replicated assets; currency translation adjustments on foreign-denominated bonds; changes in the fair value of unaffiliated common stocks; changes in the fair value of bonds and preferred stocks that are carried at fair value; and changes in the inflation adjustments on U.S Treasury inflation-indexed securities. Changes in the Company's equity investments in partnerships and limited liability companies, including the earnings as reported on the financial statements, earnings recorded as accumulated undistributed earnings, foreign exchange asset valuation and mark-to-market on operating assets, and certain subsidiaries and affiliates are also reported as changes in unrealized capital gains (losses). Unrealized capital gains (losses) are recorded as a change in net unrealized capital gains (losses), net of tax, within the Statutory Statements of Changes in Surplus.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

3. *New accounting standards*

Adoption of new accounting standards

In June 2022, the NAIC adopted modifications to SSAP No. 25, Affiliates and Other Related Parties and SSAP No. 43R, Loan-Backed and Structured Securities, effective December 31, 2022. The modifications clarify application of the existing affiliate definition and incorporate disclosure requirements for all investments that involve related parties, regardless of whether they meet the affiliate definition. The revisions to SSAP No. 43R also included additional clarifications that the investments from any arrangements that results in direct or indirect control, which include but are not limited to control through a servicer, shall be reported as affiliated investments. The modifications did not have a material effect on the Company's financial statements.

In August 2023, the NAIC adopted INT 23-01T — Disallowed IMR ("INT 23-01T"). INT 23-01T provides optional, limited-term guidance for the assessment of disallowed IMR for up to 10% of adjusted general account capital and surplus. An insurer's capital and surplus must first be adjusted to exclude certain "soft assets" including net positive goodwill, electronic data processing equipment and operating system software, net deferred tax assets and admitted disallowed IMR. An insurer will only be able to admit the negative IMR if the insurer's risk-based capital is over 300% authorized control level after adjusting to remove the assets described above.

As adopted, negative IMR may be admitted first in the insurer's general account and then, if all disallowed IMR in the general account is admitted and the percentage limit is not reached, to the separate account proportionately between insulated and noninsulated accounts. If the insurer can demonstrate historical practice in which acquired gains from derivatives were also reversed to IMR (as liabilities) and amortized, there is no exclusion for derivatives losses. INT 23-01T was adopted by the Company as of September 30, 2023 and will be effective through December 31, 2025. To the extent the Company's IMR balance is a net negative, the effects of INT 23-01T will be reflected in the Company's financial position, results of operations, and financial statement disclosures. The Company has adopted this guidance and the adoption resulted in an admitted disallowed IMR of \$1,112 million.

In August 2023, the NAIC adopted revisions to clarify and incorporate a new bond definition within disclosures SSAP No. 26 – *Bonds*, SSAP No. 43 – *Asset-Backed Securities*, and other related SSAPs, effective January 1, 2025. The revisions were issued in connection with its principle-based bond definition project, the Bond Project.

The Bond Project began in October 2020 through the development of a principle-based bond definition to be used for all securities in determining whether they qualify for reporting on the statutory annual statement Schedule D. Within the new bond definition, bonds are classified as an "issuer credit obligation" or an "asset-backed security." An "issuer credit obligation" is defined as a bond where repayment is supported by the general creditworthiness of an operating entity, and an "asset-backed security" is defined as a bond issued by an entity created for the primary purpose of raising capital through debt backed by financial assets. The revisions to SSAP No. 26 reflect the principle-based bond definition, and SSAP No. 43 provides accounting and reporting guidance for investments that qualify as asset-backed securities under the new bond definition. Upon adoption, investments that do not qualify as bonds will not be permitted to be reported as bonds on Schedule D, Part 1 thereafter as there will be no grandfathering for existing investments that do not qualify under the revised SSAPs. The Company is currently assessing the impacts of the adopted SSAP No. 26, SSAP No. 43 and other related SSAPs in relation to the financial statements.

In March 2023, the NAIC adopted modifications to SSAP No. 34 – *Investment Income Due and Accrued*, effective December 31, 2023. The modifications require additional disclosures and data capture related to gross, non-admitted and admitted amounts for interest income due and accrued, deferred interest, and paid-in-kind (PIK) interest.

In August 2023, the NAIC adopted revisions to further clarify the PIK interest disclosure in SSAP No. 34, effective December 31, 2023. The revisions clarify that decreasing amounts to principal balances are first applied to any PIK interest included in the principal balance. The original principal would not be reduced until the PIK interest had been fully eliminated from the balance. The revisions also provide a practical expedient for determining the PIK interest in the cumulative balance by subtracting the original principal/ par value from the current principal/ par value, with the resulting PIK interest not to go less than zero. The modifications did not have a material effect on the Company's impact of PIK in relation to the financial statements.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

4. Fair value of financial instruments

The following presents a summary of the carrying values and fair values of the Company's financial instruments:

	December 31, 2023				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	\$ 5,060	\$ 4,744	\$ -	\$ 4,744	\$ -
All other governments	1,242	1,092	-	1,062	30
States, territories and possessions	231	229	-	229	-
Political subdivisions	363	353	-	353	-
Special revenue	4,986	4,975	-	4,938	37
Industrial and miscellaneous	122,721	114,598	66	50,893	63,639
Parent, subsidiaries and affiliates	9,830	9,410	-	1,406	8,004
Preferred stocks	446	470	96	-	374
Common stocks - subsidiaries and affiliates	430	430	253	-	177
Common stocks - unaffiliated	1,623	1,623	666	-	957
Mortgage loans - commercial	19,299	17,885	-	-	17,885
Mortgage loans - residential	4,722	4,449	-	-	4,449
Derivatives:					
Interest rate swaps	17,292	12,277	-	12,277	-
Options	547	547	68	479	-
Currency swaps	2,831	2,831	-	2,831	-
Forward contracts	13	13	-	13	-
Credit default swaps	1	1	-	1	-
Financial futures	56	56	56	-	-
Cash, cash equivalents and short-term investments	11,134	11,134	782	10,352	-
Separate account assets	52,593	52,593	35,002	15,677	1,914
Financial liabilities:					
GICs	16,207	15,550	-	-	15,550
Group annuity contracts and other deposits	2,053	1,841	-	-	1,841
Individual annuity contracts	25,861	24,495	-	-	24,495
Supplementary contracts	942	943	-	-	943
Repurchase agreements	3,219	3,219	-	3,219	-
Commercial paper	50	50	-	50	-
Derivatives:					
Interest rate swaps	11,922	12,289	-	12,289	-
Options	35	35	35	-	-
Currency swaps	1,294	1,309	-	1,309	-
Forward contracts	301	303	-	303	-
Credit default swaps	153	152	-	152	-
Financial futures	29	29	29	-	-

Common stocks-subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of \$25,066 million.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

	December 31, 2022				
	Carrying Value	Fair Value	Level 1	Level 2	Level 3
	(In Millions)				
Financial assets:					
Bonds:					
U. S. government and agencies	\$ 4,764	\$ 4,428	\$ -	\$ 4,428	\$ -
All other governments	1,635	1,385	-	1,323	62
States, territories and possessions	248	241	-	241	-
Political subdivisions	405	388	-	388	-
Special revenue	4,187	4,111	-	4,102	9
Industrial and miscellaneous	117,023	105,791	-	45,812	59,979
Parent, subsidiaries and affiliates	8,183	7,956	-	1,015	6,941
Preferred stocks	451	446	45	-	401
Common stocks - subsidiaries and affiliates	460	460	110	-	350
Common stocks - unaffiliated	1,477	1,477	507	-	970
Mortgage loans - commercial	20,756	19,152	-	-	19,152
Mortgage loans - residential	4,216	3,892	-	-	3,892
Derivatives:					
Interest rate swaps	18,287	18,456	-	18,456	-
Options	639	639	31	608	-
Currency swaps	3,071	3,071	-	3,071	-
Forward contracts	14	14	-	14	-
Financial futures	21	21	21	-	-
Cash, cash equivalents and short-term investments	5,568	5,568	420	5,148	-
Separate account assets	53,414	53,414	34,931	16,790	1,693
Financial liabilities:					
GICs	14,701	13,803	-	-	13,803
Group annuity contracts and other deposits	2,162	1,890	-	-	1,890
Individual annuity contracts	17,000	16,214	-	-	16,214
Supplementary contracts	1,139	1,140	-	-	1,140
Repurchase agreements	3,042	3,042	-	3,042	-
Commercial paper	250	250	-	250	-
Derivatives:					
Interest rate swaps	13,036	18,165	-	18,165	-
Options	6	6	6	-	-
Currency swaps	709	362	-	362	-
Forward contracts	236	236	-	236	-
Interest rate caps and floors	13	13	-	13	-
Credit default swaps	3	3	3	-	-

Common stocks - subsidiaries and affiliates do not include unconsolidated subsidiaries, which had statutory carrying values of \$24,223 million.

Fair value is defined as the price that would be received from selling an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The authoritative guidance for fair value establishes a measurement framework that includes a hierarchy used to classify the inputs used in measuring fair value. The hierarchy prioritizes the inputs to valuation techniques into three levels. Each level reflects a unique description of the inputs that are significant to the fair value measurements. The levels of the fair value hierarchy are as follows:

Level 1 – Observable inputs in the form of quoted prices for identical instruments in active markets.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Level 2 – Observable inputs other than Level 1 prices, such as quoted prices for similar assets or liabilities, quoted prices in markets that are not active or other inputs that are observable or can be derived from observable market data for substantially the full term of the assets or liabilities.

Level 3 – One or more unobservable inputs that are supported by little or no market activity and are significant to the fair value of the assets or liabilities. Level 3 assets and liabilities include financial instruments whose value is determined using internal models, as well as instruments for which the determination of fair value requires significant management judgment or estimation.

When available, the Company generally uses unadjusted quoted market prices from independent sources to determine the fair value of investments, and classifies such items within Level 1 of the fair value hierarchy. If quoted prices are not available, prices are derived from observable market data for similar assets in an active market or obtained directly from brokers for identical assets traded in inactive markets. Investments that are priced using these inputs are classified within Level 2 of the fair value hierarchy. When some of the necessary observable inputs are unavailable, fair value is based upon internally developed models. These models use inputs not directly observable or correlated with observable market data. Typical inputs, which are integrated in the Company's internal discounted cash flow models and discounted earnings models include, but are not limited to, issuer spreads derived from internal credit ratings and benchmark yields such as SOFR, cash flow estimates and earnings before interest, taxes, depreciation and amortization estimates. Investments that are priced with such unobservable inputs are classified within Level 3 of the fair value hierarchy.

The Company reviews the fair value hierarchy classifications at each reporting period. Overall, reclassifications between levels occur when there are changes in the observability of inputs and market activity used in the valuation of a financial asset or liability. Such reclassifications are reported as transfers between levels at the beginning fair value for the reporting period in which the changes occur. Given the types of assets classified as Level 1 (primarily equity securities including mutual fund investments), transfers between Level 1 and Level 2 measurement categories are expected to be infrequent. Transfers into and out of Level 3 are summarized in the schedule of changes in Level 3 assets and liabilities.

The fair value of group annuity contracts and other deposits is determined by multiplying the book value of the contract by an average market value adjustment factor. The market value adjustment factor is directly related to the difference between the book value of client liabilities and the present value of installment payments discounted at current market value yields. The market value yield is measured by the Barclay's Aggregate Bond Index, subject to certain adjustments, and the installment period is equivalent to the duration of the Company's invested asset portfolio.

The fair value of individual annuity and supplementary contracts is determined using one of several methods based on the specific contract type. For short-term contracts, generally less than 30 days, the fair value is assumed to be the book value. For contracts with longer durations, GICs and investment-type contracts, the fair value is determined by calculating the present value of future cash flows discounted at current market interest rates, the risk-free rate or a current pricing yield curve based on pricing assumptions using assets of a comparable corporate bond quality. Annuities receiving dividends are accumulated at the average minimum guaranteed rate and discounted at the risk-free rate. All others are valued using cash flow projections from the Company's asset/liability management analysis.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following presents the Company's fair value hierarchy for assets and liabilities that are carried at fair value:

	December 31, 2023			
	Level 1	Level 2	Level 3	Total
	(In Millions)			
Financial assets:				
Bonds				
Special revenue	-	2	-	2
Industrial and miscellaneous	66	107	172	345
Preferred Stock	24	-	63	87
Common stock - subsidiaries and affiliates	253	-	177	430
Common stock - unaffiliated	666	-	957	1,623
Derivatives				
Interest rate swaps	-	17,287	-	17,287
Options	68	479	-	547
Currency swaps	-	2,831	-	2,831
Forward contracts	-	13	-	13
Financial futures	56	-	-	56
Separate account assets	35,002	15,677	1,914	52,593
Total financial assets carried at fair value	\$ 36,135	\$ 36,396	\$ 3,283	\$ 78,814
Financial liabilities:				
Derivatives:				
Interest rate swaps	\$ -	\$ 11,922	\$ -	\$ 11,922
Options	35	-	-	35
Currency swaps	-	192	-	192
Forward Contracts	-	301	-	301
Credit default swaps	-	153	-	153
Financial futures	29	-	-	29
Total financial liabilities carried at fair value	\$ 64	\$ 12,568	\$ -	\$ 12,632

For the year ended December 31, 2023 and the year ended December 31, 2022, the Company did not have any financial instruments that were carried at net asset value as a practical expedient.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following presents the Company's fair value hierarchy for assets and liabilities that are carried at fair value:

	December 31, 2022			
	Level 1	Level 2	Level 3	Total
	(In Millions)			
Financial assets:				
Bonds:				
All other governments	\$ -	6	-	\$ 6
Special revenue	-	1	-	1
Industrial and miscellaneous	-	85	220	305
Preferred stocks	21	-	47	68
Common stocks - subsidiaries and affiliates	110	-	350	460
Common stocks - unaffiliated	507	-	970	1,477
Derivatives:				
Interest rate swaps	-	18,287	-	18,287
Options	31	608	-	639
Currency swaps	-	3,071	-	3,071
Forward contracts	-	14	-	14
Financial futures	21	-	-	21
Separate account assets	34,931	16,790	1,693	53,414
Total financial assets carried at fair value	\$ 35,621	\$ 38,862	\$ 3,280	\$ 77,763
Financial liabilities:				
Derivatives:				
Interest rate swaps	\$ -	13,036	-	\$ 13,036
Options	6	-	-	6
Currency swaps	-	122	-	122
Forward contracts	-	236	-	236
Credit default swaps	-	13	-	13
Financial futures	3	-	-	3
Total financial liabilities carried at fair value	\$ 9	\$ 13,407	\$ -	\$ 13,416

The Company reviews the fair value hierarchy classifications each reporting period. Changes in the observability of the valuation attributes and the level of market activity may result in a reclassification of certain financial assets or liabilities between fair value hierarchy classifications. Such reclassifications are reported as transfers between levels in the beginning fair value for the reporting period in which the changes occur.

Valuation Techniques and Inputs

The Company determines the fair value of its investments using primarily the market approach or the income approach. The use of quoted prices for identical assets and matrix pricing or other similar techniques are examples of market approaches, while the use of discounted cash flow methodologies is an example of the income approach. The Company attempts to maximize the use of observable inputs and minimize the use of unobservable inputs in selecting whether the market or the income approach is used.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

A description of the significant valuation techniques and inputs to the determination of estimated fair value for the more significant asset and liability classes measured at fair value on a recurring basis and categorized within Level 2 and Level 3 of the fair value hierarchy is as follows:

Separate account assets – These assets primarily include bonds (industrial and miscellaneous; U.S. government and agencies), and derivatives. Their fair values are determined as follows:

Bonds (Industrial and miscellaneous) – These securities are principally valued using the market or the income approaches. Level 2 valuations are based primarily on quoted prices in markets that are not active, broker quotes, matrix pricing or other similar techniques that use standard market observable inputs such as benchmark yields, spreads versus benchmark yields, new issuances, issuer ratings, duration, and trades of identical or comparable securities. Privately placed securities are valued using discounted cash flow models using standard market observable inputs, and inputs derived from, or corroborated by, market observable data including market yield curve, duration, call provisions, observable prices and spreads for similar publicly traded or privately traded issuances that incorporate the credit quality and industry sector of the issuer. This level also includes securities priced by independent pricing services that use observable inputs. Valuations based on matrix pricing or other similar techniques that utilize significant unobservable inputs or inputs that cannot be derived principally from, or corroborated by, observable market data, including adjustments for illiquidity, delta spread adjustments or spreads to reflect industry trends or specific credit-related issues are classified as Level 3. In addition, inputs including quoted prices for identical or similar securities that are less liquid and based on lower levels of trading activity than securities classified in Level 2 are classified as Level 3.

Bonds (U.S. government and agencies) – These securities are principally valued using the market approach. Level 2 valuations are based primarily on quoted prices in markets that are not active, or using matrix pricing or other similar techniques using standard market observable inputs such as the benchmark U.S. Treasury yield curve, the spreads versus the U.S. Treasury yield curve for the identical security and comparable securities that are actively traded.

Derivative assets and liabilities – These financial instruments are primarily valued using the market approach. The estimated fair value of derivatives is based primarily on quotations obtained from counterparties and independent sources, such as quoted market values received from brokers. These quotations are compared to internally derived prices and a price challenge is lodged with the counterparties and an independent source when a significant difference cannot be explained by appropriate adjustments to the internal model. When quoted market values are not reliable or available, the value is based upon an internal valuation process using market observable inputs that other market participants would use. Significant inputs to the valuation of derivative financial instruments include overnight index swaps (OIS) and SOFR basis curves, interest rate volatility, swap yield curve, currency spot rates, cross currency basis curves and dividend yields. Due to the observability of the significant inputs to these fair value measurements, they are classified as Level 2.

The use of different assumptions or valuation methodologies may have a material impact on the estimated fair value amounts. For the periods presented, there were no significant changes to the Company's valuation techniques.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following presents changes in the Company's Level 3 assets carried at fair value:

	Balance as of 1/1/23	Gains (Losses) in Net Income	Losses (Gains) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers			Balance as of 12/31/23
	(In Millions)										
Financial assets:											
Bonds:											
Industrial and miscellaneous	\$ 220	\$ (4)	\$ (10)	\$ 36	\$ 1	\$ (2)	\$ (13)	\$ -	\$ -	\$ (56)	\$ 172
Preferred stocks	47	-	11	3	-	-	-	-	-	2	63
Common stocks - subsidiaries and affiliates	350	7	(216)	21	20	(47)	-	48	-	(6)	177
Common stocks - unaffiliated	970	24	(53)	60	26	(29)	(38)	-	-	(3)	957
Separate account assets	1,693	271	-	134	-	(182)	(2)	-	-	-	1,914
Total financial assets	\$ 3,280	\$ 298	\$ (268)	\$ 254	\$ 47	\$ (260)	\$ (53)	\$ 48	\$ -	\$ (63)	\$ 3,283

	Balance as of 1/1/22	Gains (Losses) in Net Income	Losses (Gains) in Surplus	Purchases	Issuances	Sales	Settlements	Transfers			Balance as of 12/31/22
	(In Millions)										
Financial assets:											
Bonds:											
Industrial and miscellaneous	\$ 187	\$ 3	\$ (9)	\$ 19	\$ 9	\$ -	\$ (52)	\$ -	\$ -	\$ 63	\$ 220
Preferred stocks	18	-	(18)	-	-	-	-	-	-	47	47
Common stocks - subsidiaries and affiliates	253	(13)	110	(793)	980	(65)	(6)	-	-	(116)	350
Common stocks - unaffiliated	753	28	2	327	3	(27)	(112)	-	(3)	(1)	970
Separate account assets	1,894	(174)	-	282	-	(296)	-	-	(13)	-	1,693
Total financial assets	\$ 3,105	\$ (156)	\$ 85	\$ (165)	\$ 992	\$ (388)	\$ (170)	\$ -	\$ (16)	\$ (7)	\$ 3,280

Other transfers include assets that are either no longer carried at fair value or have just begun to be carried at fair value, such as assets with no level changes but a change in the lower of cost or market carrying basis. Industrial and miscellaneous bonds in other contain assets that are now carried at fair value due to ratings changes and assets are no longer carried at fair value where the fair value is now higher than the book value.

Level 3 transfers in are assets that are consistently carried at fair value but have had a level change. Common stocks unaffiliated assets were transferred from Level 2 to Level 3 due to a change in the observability of pricing inputs, at the beginning fair value for the reporting period.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

5. Investments

The Company maintains a diversified investment portfolio. Investment policies limit concentration in any asset class, geographic region, industry group, economic characteristic, investment quality or individual investment.

a. Bonds

The carrying value and fair value of bonds were as follows:

	December 31, 2023			
	Carrying Value	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
	(In Millions)			
U.S. government and agencies	\$ 5,060	\$ 70	\$ 385	\$ 4,744
All other governments	1,242	13	163	1,092
States, territories and possessions	231	4	6	229
Political subdivisions	363	7	17	353
Special revenue	4,986	113	125	4,975
Industrial and miscellaneous	122,721	841	8,964	114,598
Parent, subsidiaries and affiliates	9,830	20	439	9,410
Total	\$ 144,433	\$ 1,068	\$ 10,099	\$ 135,401

The December 31, 2023 gross unrealized losses exclude \$127 million of losses included in the carrying value. These losses include \$126 million from NAIC Class 6 bonds and \$1 million from RMBS and CMBS whose ratings were obtained from outside modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

	December 31, 2022			
	Carrying Value	Gross Unrealized Gains	Gross Unrealized Losses	Fair Value
	(In Millions)			
U.S. government and agencies	\$ 4,764	\$ 59	\$ 395	\$ 4,428
All other governments	1,635	15	265	1,385
States, territories and possessions	248	2	9	241
Political subdivisions	405	6	23	388
Special revenue	4,187	106	182	4,111
Industrial and miscellaneous	117,023	391	11,623	105,791
Parent, subsidiaries and affiliates	8,183	1	228	7,956
Total	\$ 136,445	\$ 580	\$ 12,725	\$ 124,300

The December 31, 2022 gross unrealized losses exclude \$102 million of losses included in the carrying value. These losses include \$104 million from NAIC Class 6 bonds and \$(2) million from RMBS and CMBS whose ratings were obtained from outside modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The quality of the bond portfolio is determined by the use of SVO ratings and the equivalent rating agency designations, except for RMBS and CMBS that use outside modelers. The following sets forth the NAIC class ratings for the bond portfolio including RMBS and CMBS:

NAIC Class	Equivalent Rating Agency Designation	December 31,			
		2023		2022	
		Carrying Value	% of Total	Carrying Value	% of Total
(\$ In Millions)					
1	Aaa/ Aa/ A	\$ 81,184	56%	\$ 73,290	54%
2	Baa	53,888	37	51,732	38
3	Ba	3,617	3	5,495	4
4	B	2,842	2	2,888	2
5	Caa and lower	2,512	2	2,603	2
6	In or near default	390	-	437	-
Total		\$ 144,433	100%	\$ 136,445	100%

The following summarizes NAIC ratings for RMBS and CMBS investments subject to NAIC modeling:

NAIC Class	December 31,							
	2023				2022			
	RMBS		CMBS		RMBS		CMBS	
	Carrying Value	% of Total	Carrying Value	% of Total	Carrying Value	% of Total	Carrying Value	% of Total
(\$ In Millions)								
1	\$ 246	95%	\$ 2,020	75%	\$ 391	82%	\$ 1,693	75%
2	-	-	237	9	29	6	202	9
3	1	-	155	6	32	7	160	7
4	5	2	143	5	14	3	83	4
5	7	3	63	2	10	2	81	4
6	-	-	72	3	2	-	12	1
	\$ 259	100%	\$ 2,690	100%	\$ 478	100%	\$ 2,231	100%

The following is a summary of the carrying value and fair value of bonds as of December 31, 2023 by contractual maturity. Expected maturities may differ from contractual maturities because issuers may have the right to call or prepay obligations with or without prepayment penalties. Securities with more than one maturity date are included in the table using the final maturity date.

	Carrying Value	Fair Value
(In Millions)		
Due in one year or less	\$ 8,289	\$ 7,949
Due after one year through five years	32,923	32,288
Due after five years through ten years	38,086	36,551
Due after ten years	65,135	58,613
Total	\$ 144,433	\$ 135,401

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Sales proceeds and related gross realized capital gains (losses) from bonds were as follows:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Proceeds from sales	\$ 11,489	\$ 16,097	\$ 21,687
Gross realized capital gains from sales	102	143	406
Gross realized capital losses from sales	(645)	(624)	(135)

The following is a summary of the fair values and gross unrealized losses aggregated by bond category and length of time that the securities were in a continuous unrealized loss position:

	December 31, 2023					
	Less Than 12 Months			12 Months or Longer		
	Fair Value	Unrealized Losses	Number of Issuers	Fair Value	Unrealized Losses	Number of Issuers
	(\$ In Millions)					
U.S. government and agencies	\$ 576	\$ 5	6	\$ 2,067	\$ 380	13
All other governments	26	-	5	882	163	32
States, territories and possessions	10	-	3	98	6	8
Political subdivisions	13	-	3	176	17	10
Special revenue	331	8	27	1,260	118	163
Industrial and miscellaneous	5,762	265	592	65,928	8,840	2,940
Parent, subsidiaries and affiliates	5,042	316	10	2,429	123	21
Total	\$ 11,760	\$ 594	646	\$ 72,840	\$ 9,647	3,187

The December 31, 2023 gross unrealized losses include \$127 million of losses included in the carrying value. These losses include \$126 million from NAIC Class 6 bonds and \$1 million from RMBS and CMBS whose ratings were obtained from outside modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

	December 31, 2022					
	Less Than 12 Months			12 Months or Longer		
	Fair Value	Unrealized Losses	Number of Issuers	Fair Value	Unrealized Losses	Number of Issuers
	(\$ In Millions)					
U.S. government and agencies	\$ 1,609	\$ 243	15	\$ 1,113	\$ 153	7
All other governments	447	46	33	737	220	27
States, territories and possessions	87	3	11	74	6	3
Political subdivisions	155	13	17	62	10	4
Special revenue	1,477	123	176	291	58	67
Industrial and miscellaneous	51,038	5,265	2,735	27,854	6,471	1,807
Parent, subsidiaries and affiliates	2,575	83	28	1,046	144	11
Total	\$ 57,388	\$ 5,776	3,015	\$ 31,177	\$ 7,062	1,926

The December 31, 2022 gross unrealized losses include \$102 million of losses included in the carrying value. These losses include \$104 million from NAIC Class 6 bonds and \$(2) million from RMBS and CMBS whose ratings were obtained from outside modelers. These losses were primarily included in industrial and miscellaneous or parent, subsidiaries and affiliates.

As of December 31, 2023 and 2022, management has not deemed these unrealized losses to be other than temporary because the investment's carrying value is expected to be realized and the Company has the ability and intent not to sell these investments until recovery, which may be at maturity.

As of December 31, 2023, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of \$17,178 million. Securities in an unrealized loss position for less than 12 months had a fair value of \$2,151 million and unrealized losses of \$48 million. Securities in an unrealized loss position for greater than 12 months had a fair value of \$15,027 million and unrealized losses of \$1,261 million. These securities were primarily categorized as industrial and miscellaneous or parent, subsidiaries and affiliates.

As of December 31, 2022, investments in structured and loan-backed securities that had unrealized losses, which were not recognized in earnings, had a fair value of \$20,311 million. Securities in an unrealized loss position for less than 12 months had a fair value of \$14,684 million and unrealized losses of \$892 million. Securities in an unrealized loss position for greater than 12 months had a fair value of \$5,624 million and unrealized losses of \$894 million. These securities were primarily categorized as industrial and miscellaneous or parent, subsidiaries and affiliates.

In the course of the Company's investment management activities, securities may be sold and reacquired within 30 days to enhance the Company's yield on its investment portfolio. The Company did not sell any securities with the NAIC Designation 3 or below for the years ended December 31, 2023 or 2022, that were reacquired within 30 days of the sale date.

The Company had assets on deposit with government authorities or trustees, as required by law, in the amount of \$10 million as of December 31, 2023 and December 31, 2022.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Residential mortgage-backed exposure

RMBS are included in the U.S. government and agencies, special revenue, and industrial and miscellaneous bond categories. The Alt-A category includes option adjustable-rate mortgages and the subprime category includes 'scratch and dent' or reperforming pools, high loan-to-value pools, and pools where the borrowers have very impaired credit but the average loan-to-value is low, typically 70% or below. In identifying Alt-A and subprime exposure, management used a combination of qualitative and quantitative factors, including FICO scores and loan-to-value ratios.

As of December 31, 2023, RMBS had a total carrying value of \$3,775 million and a fair value of \$3,756 million, of which approximately 4%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of \$1,326 million and a fair value of \$1,312 million. As of December 31, 2022, RMBS had a total carrying value of \$2,308 million and a fair value of \$2,266 million, of which approximately 8%, based on carrying value, was classified as Alt-A. Alt-A and subprime RMBS had a total carrying value of \$999 million and a fair value of \$993 million.

During the year ended December 31, 2023, there were no significant credit downgrades for the securities held by the Company that were backed by residential mortgage pools.

Leveraged loan exposure

Leveraged loans are loans extended to companies that already have considerable amounts of debt. The Company reports leveraged loans as bonds. These leveraged loans have interest rates higher than typical loans, reflecting the additional risk of default from issuers with high debt-to-equity ratios.

As of December 31, 2023, total leveraged loans and leveraged loan CDOs had a carrying value of \$27,844 million and a fair value of \$27,509 million, of which approximately 80%, based on carrying value, were domestic leveraged loans and CDOs. As of December 31, 2022, total leveraged loans and leveraged loan CDOs had a carrying value of \$26,332 million and a fair value of \$25,664 million, of which approximately 81%, based on carrying value, were domestic leveraged loans and CDOs.

Commercial mortgage-backed exposure

The Company holds bonds backed by pools of commercial mortgages. The mortgages in these pools have varying risk characteristics related to underlying collateral type, borrower's risk profile and ability to refinance and the return provided to the borrower from the underlying collateral. These investments had a carrying value of \$2,693 million and fair value of \$2,285 million as of December 31, 2023 and a carrying value of \$2,669 million and fair value of \$2,285 million as of December 31, 2022.

b. Preferred stocks

The carrying value and fair value of preferred stocks were as follows:

	December 31,	
	2023	2022
	(In Millions)	
Carrying value	\$ 446	\$ 451
Gross unrealized gains	29	9
Gross unrealized losses	(5)	(14)
Fair value	\$ 470	\$ 446

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

As of December 31, 2023, investments in preferred stocks in an unrealized loss position included holdings with a fair value of \$267 million in 19 issuers, \$265 million of which was in an unrealized loss position for more than 12 months. As of December 31, 2022, investments in preferred stocks in an unrealized loss position included holdings with a fair value of \$245 million in 17 issuers, \$55 million of which was in an unrealized loss position for more than 12 months. Based upon the Company's impairment review process discussed in *Note 2dd*, "*Net realized capital (losses) gains including other-than-temporary impairments and unrealized capital gains (losses)*" the decline in value of these securities was not considered to be other than temporary as of December 31, 2023 or 2022.

The Company held preferred stocks for which the transfer of ownership was restricted by contractual requirements with carrying values of \$201 million as of December 31, 2023 and \$323 million as of December 31, 2022.

c. Common stocks – subsidiaries and affiliates

The Company has two primary domestic life insurance subsidiaries, C.M. Life, which primarily provides fixed and variable annuities and universal life insurance business, and MML Bay State, a subsidiary of C.M. Life, which primarily issues variable life and bank-owned life insurance policies.

Summarized below is certain combined statutory financial information for the unconsolidated domestic life insurance subsidiaries:

	As of and for the Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Total revenue	\$ 433	\$ 577	\$ 682
Net income	48	155	106
Assets	12,653	12,870	14,270
Liabilities	10,515	11,090	12,636
Shareholder's equity	2,138	1,780	1,634

In 2023, C.M. Life did not pay any dividends to MassMutual and paid \$163 million in dividends to MassMutual in 2022.

In 2023, MassMutual did not make any contributions to C.M. Life and contributed capital of \$50 million to C.M. Life in 2022.

MMHLLC, a wholly-owned subsidiary of MassMutual, is the parent of subsidiaries that include Barings LLC (Barings) and deals in markets that include retail and institutional asset management entities and registered broker dealers.

The MMHLLC statutory carrying value was \$17.6 billion, which included \$106 million of nonadmitted asset adjustments as of December 31, 2023 and \$17.2 billion as of December 31, 2022, which included \$151 million nonadmitted asset adjustments.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Summarized below is certain U.S. GAAP financial information for MMHLLC:

	As of and for the Years Ended December 31,		
	2023	2022	2021
	(In Billions)		
Total revenue	\$ 3.4	\$ 3.6	\$ 4.9
Net income	0.7	0.6	1.7
Assets	27.2	27.2	25.5
Liabilities	9.1	8.2	7.6
Member's equity	18.1	18.9	17.9

MMHLLC paid \$730 million in dividends to MassMutual for the year ended December 31, 2023, \$450 million of which were declared in 2022, and paid \$604 million in dividends to MassMutual for the year ended December 31, 2022, \$344 million of which were declared in 2021.

MMHLLC declared an additional \$630 million in dividends to MassMutual for the year ended December 31, 2023, which will be paid in 2024.

MassMutual contributed capital of \$235 million to MMHLLC for the year ended December 31, 2023 and \$660 million for the year ended December 31, 2022.

Summarized below is certain U.S. GAAP financial information for Glidepath:

	As of and for the Years Ended December 31,	
	2023	2022
	(In Billions)	
Total revenue	\$ 0.8	\$ 1.2
Net income (loss)	0.8	1.0
Assets	53.4	51.0
Liabilities	51.5	48.8
Member's equity	1.9	2.2

Summarized below is certain U.S. GAAP financial information for MMIH:

	As of and for the Years Ended December 31,		
	2023	2022	2021
	(In Billions)		
Total revenue	\$ 0.4	\$ 0.3	\$ 0.3
Net income	0.1	0.1	0.1
Assets	10.1	9.3	8.8
Liabilities	8.2	7.6	7.0
Member's Equity	1.9	1.7	1.8

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Subsidiaries of MMHLLC are involved in litigation and investigations arising in the ordinary course of their business, which seek compensatory damages, punitive damages and equitable remedies. Although the Company is not aware of any actions or allegations that reasonably could give rise to a material adverse impact to the Company's financial position or liquidity, the outcome of litigation cannot be foreseen with certainty. It is the opinion of management that the ultimate resolution of these matters will not materially impact the Company's financial position or liquidity. However, the outcome of a particular proceeding may be material to the Company's Statutory Statements of Changes in Surplus for a particular period depending upon, among other factors, the size of the loss and the level of the Company's changes in surplus for the period.

The Company does not rely on dividends from its subsidiaries to meet its operating cash flow requirements. For the domestic life insurance subsidiaries, substantially all of their statutory shareholder's equity of \$1,905 million as of December 31, 2023 was subject to dividend restrictions imposed by the State of Connecticut.

For further information on related party transactions with subsidiaries and affiliates, see *Note 17. "Related party transactions"*.

d. Common stocks - unaffiliated

The adjusted cost basis and carrying value of unaffiliated common stocks were as follows:

	December 31,	
	2023	2022
	(In Millions)	
Adjusted cost basis	\$ 1,268	\$ 1,198
Gross unrealized gains	407	317
Gross unrealized losses	(52)	(38)
Carrying value	\$ 1,623	\$ 1,477

As of December 31, 2023, investments in unaffiliated common stocks in an unrealized loss position included holdings with a fair value of \$308 million in 30 issuers, \$289 million of which were in an unrealized loss position for more than 12 months. As of December 31, 2022, investments in unaffiliated common stocks in an unrealized loss position included holdings with a fair value of \$268 million in 68 issuers, \$78 million of which were in an unrealized loss position for more than 12 months. Based upon the Company's impairment review process discussed in *Note 2dd. "Net realized capital (losses) gains including other-than-temporary impairments and unrealized capital gains (losses)"* the decline in value of these securities was not considered to be other than temporary as of December 31, 2023 or 2022.

The Company held common stocks, for which the transfer of ownership was restricted by contractual requirements, with carrying values of \$106 million as of December 31, 2023 and \$135 million as of December 31, 2022.

e. Mortgage loans

Mortgage loans are comprised of commercial mortgage loans and residential mortgage loans. The Company's commercial mortgage loans primarily finance various types of real estate properties throughout the U.S., the United Kingdom and Canada. The Company holds commercial mortgage loans for which it is the primary lender or a participant or co-lender in a mortgage loan agreement and mezzanine loans that are subordinate to senior secured first liens. The Company's loan agreements with the senior lender contain negotiated provisions that are designed to maximize the Company's influence with the objective of mitigating the Company's risks as the secondary lender for mezzanine loans. Commercial mortgage loans have varying risk characteristics including, among others, the borrower's liquidity, the underlying percentage of completion of a project, the returns generated by the collateral, the refinance risk associated with maturity of the loan and deteriorating collateral value.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Residential mortgage loans are primarily seasoned pools of homogeneous residential mortgage loans substantially backed by Federal Housing Administration (FHA) and Veterans Administration (VA) guarantees. As of December 31, 2023 and 2022, the Company did not have any direct subprime exposure through the purchases of unsecuritized whole-loan pools.

Geographical concentration is considered prior to the purchase of mortgage loans and residential mortgage loan pools. The mortgage loan portfolio is diverse with no significant collateral concentrations in any particular geographic region as of December 31, 2023 or 2022.

The carrying value and fair value of the Company's mortgage loans were as follows:

	December 31, 2023		December 31, 2022	
	Carrying Value	Fair Value	Carrying Value	Fair Value
	(In Millions)			
Commercial mortgage loans:				
Primary lender	\$ 19,162	\$ 17,766	\$ 20,662	\$ 19,065
Mezzanine loans	137	119	94	87
Total commercial mortgage loans	19,299	17,885	20,756	19,152
Residential mortgage loans:				
FHA insured and VA guaranteed	1,833	1,699	2,304	2,128
Other residential loans	2,889	2,750	1,912	1,764
Total residential mortgage loans	4,722	4,449	4,216	3,892
Total mortgage loans	\$ 24,021	\$ 22,334	\$ 24,972	\$ 23,044

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The loan-to-value ratios by property type of the Company's commercial mortgage loans were as follows:

	December 31, 2023					
	Less Than 81%	81% to 95%	Above 95%	Total	% of Total	
	(\$ In Millions)					
Office	\$ 4,957	\$ 508	\$ 1,042	\$ 6,507	34%	
Apartments	5,064	417	235	5,716	30	
Industrial and other	2,765	25	24	2,814	15	
Hotels	1,742	82	92	1,916	10	
Retail	2,276	-	70	2,346	12	
Total	\$ 16,804	\$ 1,032	\$ 1,463	\$ 19,299	100%	

	December 31, 2022					
	Less Than 81%	81% to 95%	Above 95%	Total	% of Total	
	(\$ In Millions)					
Office	\$ 6,843	\$ -	\$ 34	\$ 6,877	33%	
Apartments	5,437	447	-	5,884	28	
Industrial and other	3,447	26	-	3,473	17	
Retail	2,449	-	-	2,449	12	
Hotels	1,982	91	-	2,073	10	
Total	\$ 20,158	\$ 564	\$ 34	\$ 20,756	100%	

More than 87% of the Company's commercial mortgage loans' loan-to-value ratios are below 81% for the year ended December 31, 2023. As of December 31, 2022, more than 97% of the Company's commercial mortgage loans' loan-to-value ratios are below 81%.

The Company uses an internal rating system as its primary method of monitoring credit quality. The following illustrates the Company's mortgage loan portfolio rating, translated into the equivalent rating agency designation:

	December 31, 2023								
	AAA/AA/A		BBB		BB		B	CCC and Lower	Total
	(In Millions)								
Commercial mortgage loans:									
Primary lender	\$	6,014	\$	9,680	\$	2,156	\$	875	\$ 437 \$ 19,162
Mezzanine loans		-		80		57		-	- 137
Total commercial mortgage loans		6,014		9,760		2,213		875	437 19,299
Residential mortgage loans:									
FHA insured and VA guaranteed		1,832		-		-		-	- 1,832
Other residential loans		-		2,759		23		108	- 2,889
Total residential mortgage loans		1,832		2,759		23		108	- 4,722
Total mortgage loans	\$	7,846	\$	12,519	\$	2,236	\$	983	\$ 437 \$ 24,021

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

	December 31, 2022					
	AAA/AA/A	BBB	BB	B	CCC and Lower	Total
	(In Millions)					
Commercial mortgage loans:						
Primary lender	\$ 7,632	\$ 10,300	\$ 2,306	\$ 354	\$ 70	\$ 20,662
Mezzanine loans	-	37	57	-	-	94
Total commercial mortgage loans	7,632	10,337	2,363	354	70	20,756
Residential mortgage loans:						
FHA insured and VA guaranteed	2,299	5	-	-	-	2,304
Other residential loans	61	1,832	19	-	-	1,912
Total residential mortgage loans	2,360	1,837	19	-	-	4,216
Total mortgage loans	\$ 9,992	\$ 12,174	\$ 2,382	\$ 354	\$ 70	\$ 24,972

The maximum percentage of any one commercial mortgage loan to the estimated value of secured collateral at the time the loan was originated, exclusive of mezzanine, insured, guaranteed or purchase money mortgages, was 80% as of December 31, 2023 and 100% as of December 31, 2022.

The geographic distribution of commercial mortgage loans was as follows:

	December 31, 2023	
	Carrying Value	Average Loan-to-Value Ratio
	(\$ In Millions)	
California	\$ 3,904	66%
United Kingdom	2,110	51%
New York	1,894	66%
Texas	1,812	56%
Illinois	1,444	56%
Washington	1,018	70%
District of Columbia	929	82%
All other	6,190	72%
Total commercial mortgage loans	\$ 19,301	66%

All other consists of 30 jurisdictions, with no individual exposure exceeding \$878 million.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

	December 31, 2022	
	Carrying Value	Average Loan-to-Value Ratio
	(\$ In Millions)	
California	\$ 4,632	50%
New York	2,157	54%
United Kingdom	2,008	48%
Texas	1,867	54%
Illinois	1,472	51%
Washington	1,114	53%
District of Columbia	1,041	58%
All other	6,465	55%
Total commercial mortgage loans	<u>\$ 20,756</u>	<u>53%</u>

All other consists of 31 jurisdictions, with no individual exposure exceeding \$897 million.

Interest rates, including fixed and variable, on the Company's portfolio of mortgage loans were:

	Years Ended December 31,			
	2023		2022	
	Low	High	Low	High
Commercial mortgage loans	1.8%	12.9%	1.7%	11.7%
Residential mortgage loans	2.2%	11.8%	2.2%	11.7%
Mezzanine mortgage loans	5.3%	14.4%	5.3%	13.3%

Interest rates, including fixed and variable, on new mortgage loans were:

	Years Ended December 31,			
	2023		2022	
	Low	High	Low	High
Commercial mortgage loans	4.3%	11.0%	2.6%	11.7%
Residential mortgage loans	4.2%	11.8%	2.6%	11.7%
Mezzanine mortgage loans	5.5%	8.0%	12.2%	13.3%

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NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

As of December 31, 2023, the Company had impaired mortgage loans with or without a valuation allowance or mortgage loans derecognized as a result of foreclosure, including mortgage loans subject to a participant or co-lender mortgage loan agreement with a unilateral mortgage loan foreclosure restriction or mortgage loan derecognized as a result of a foreclosure.

The following presents a summary of the Company's impaired mortgage loans as of December 31, 2023 and as of December 31, 2022:

		December 31, 2023								
		Carrying Value	Average Carrying Value	Unpaid Principal Balance	Valuation Allowance	Interest Income				
		(In Millions)								
With allowance recorded:										
Commercial mortgage loans:										
Primary lender	\$	465	\$	537	\$	624	\$	(157)	\$	24
Total		465		537		624		(157)		24
Total impaired commercial mortgage loans	\$	465	\$	537	\$	624	\$	(157)	\$	24
		December 31, 2022								
		Carrying Value	Average Carrying Value	Unpaid Principal Balance	Valuation Allowance	Interest Income				
		(In Millions)								
With no allowance recorded:										
Commercial mortgage loans:										
Primary lender	\$	14	\$	15	\$	17	\$	-	\$	1
Total		14		15		17		-		1
Total impaired commercial mortgage loans	\$	14	\$	15	\$	17	\$	-	\$	1

The Company did not hold any restructured mortgage loans, mortgage loans with principal or interest past due, or mortgage loans with suspended interest accruals as of December 31, 2023 or 2022. The carrying value of commercial mortgage loans subject to a participant or co-lender mortgage loan agreement was \$855 million as of December 31, 2023 and \$1,264 million as of December 31, 2022.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

f. Real estate

The carrying value of real estate was as follows:

	December 31, 2023	December 31, 2022
	(In Millions)	
Held for the production of income	\$ 355	\$ 351
Accumulated depreciation	(94)	(78)
Encumbrances	(285)	(285)
Held for the production of income, net	(24)	(12)
Held for sale	76	76
Accumulated depreciation	(74)	(74)
Held for sale, net	2	2
Occupied by the Company	566	574
Accumulated depreciation	(215)	(209)
Occupied by the Company, net	351	365
Total real estate	\$ 329	\$ 355

Depreciation expense on real estate was \$31 million for the year ended December 31, 2023, \$36 million for the year ended December 31, 2022 and \$91 million for the year ended December 31, 2021.

g. Partnerships and limited liability companies

The carrying value of partnership and LLC holdings by annual statement category were:

	December 31, 2023	December 31, 2022
	(In Millions)	
Joint venture interests:		
Common stocks - subsidiaries and affiliates	\$ 2,001	\$ 2,090
Common stocks - unaffiliated	3,462	3,353
Real estate	2,382	2,212
Bonds/preferred stock	735	1,058
Other	1,718	1,144
Mortgage loans	2,096	1,930
Surplus notes	385	389
LIHTCs	128	120
Total	\$ 12,907	\$ 12,296

The Company held 13 affiliated partnerships and limited liability companies in a loss position with accumulated losses of \$63 million as of December 31, 2023, and eight affiliated partnerships and limited liability companies in a loss position with accumulated losses of \$75 million as of December 31, 2022.

The Company's unexpired tax credits expire within a range of less than 1 year to 12 years.

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NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The Company recorded tax credits on these investments of \$55 million for the year ended December 31, 2023 and \$52 million for the year ended December 31, 2022. The minimum holding period required for the Company's LIHTC investments extends from 1 year to 15 years.

For determining impairments for LIHTC investments, the Company uses the present value of all future benefits, the majority of which are tax credits, discounted at a risk-free rate ranging from 4.4% for future benefits of two years to 3.9% for future benefits of ten or more years, and compares the result to its current carry value. The Company recorded \$14 million of impairments for the year ended December 31, 2023.

h. Derivatives

The Company uses derivative financial instruments in the normal course of business to manage risks, primarily to reduce currency, interest rate and duration imbalances determined in asset/liability analyses. The Company also uses a combination of derivatives and fixed income investments to create replicated synthetic investments. These replicated synthetic investments are created when they are economically more attractive than the actual instrument or when similar instruments are unavailable. Replicated synthetic investments are created either to hedge and reduce the Company's credit exposure or to create an investment in a particular asset. The Company held replicated synthetic investments with a notional amount of \$31,687 million as of December 31, 2023 and \$31,264 million as of December 31, 2022, as defined under statutory accounting practices as the result of pairing of a long derivative contract with cash instruments.

The Company's derivative strategy employs a variety of derivative financial instruments: including interest rate, currency, equity, bond, and credit default swaps; options; forward contracts and financial futures. Investment risk is assessed on a portfolio basis and individual derivative financial instruments are not generally designated in hedging relationships; therefore, as allowed by statutory accounting practices, the Company intentionally has not applied hedge accounting.

Interest rate swaps are primarily used to more closely match the cash flows of assets and liabilities. Interest rate swaps are also used to mitigate changes in the value of assets anticipated to be purchased and other anticipated transactions and commitments. The Company uses currency swaps for the purpose of managing currency exchange risks in its assets and liabilities.

The Company does not sell credit default swaps as a participant in the credit insurance market. The Company does, however, use credit default swaps as part of its investment management process. The Company buys credit default swaps as an efficient means to reduce credit exposure to particular issuers or sectors in the Company's investment portfolio. The Company sells credit default swaps in order to create synthetic investment positions that enhance the return on its investment portfolio by providing comparable exposure to fixed income securities that might not be available in the primary market.

Options grant the purchaser the right to buy or sell a security or enter a derivative transaction at a stated price within a stated period. The Company's option contracts have terms of up to 45 years. A swaption is an option to enter an interest rate swap to either receive or pay a fixed rate at a future date. The Company purchases these options for the purpose of managing interest rate risks in its assets and liabilities.

The Company adopted a clearly defined hedging strategy (CDHS) to enable the Company to incorporate currently held hedges in risk-based capital (RBC) calculations. The CDHS is used to significantly mitigate the impact that movements in capital markets have on the liabilities associated with annuity guarantees. The hedge portfolio consists mainly of interest rate swaps, equity swaps, interest rate swaptions and equity futures, and provides protection in the stress scenarios under which RBC is calculated. The hedge portfolio has offsetting impacts relative to the total asset requirement for RBC and surplus for GMDb and VAGLB.

The Company utilizes certain other agreements including forward contracts and financial futures. In addition, the Company also uses "to be announced" forward contracts (TBAs) to hedge interest rate risk and participate in the mortgage-backed securities market in an efficient and cost-effective way. Typically, the price is agreed upon at contract inception and payment is made at a specified future date. The Company usually does not purchase TBAs with settlement by the first possible delivery date and thus, accounts for these TBAs as derivatives. TBAs that settle on the

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

first possible delivery date are accounted for as bonds. The Company's futures contracts are exchange traded and have credit risk. Margin requirements are met with the deposit of securities. Futures contracts are generally settled with offsetting transactions. Forward contracts and financial futures are used by the Company to reduce exposures to various risks including interest rates and currency rates.

The Company's principal derivative exposures to market risk are interest rate risk, which includes inflation and credit risk. Interest rate risk pertains to the change in fair value of the derivative instruments as a result of changes in market interest rates. The Company is exposed to credit-related losses in the event of nonperformance by counterparties to derivative financial instruments. The Company regularly monitors counterparty credit ratings, derivative positions, valuations and the value of collateral posted to ensure counterparties are credit-worthy and the concentration of exposure is minimized and monitors its derivative credit exposure as part of its overall risk management program.

The Company enters derivative transactions through bilateral derivative agreements with counterparties, or through over the counter cleared derivatives with a counterparty and the use of a clearinghouse. To minimize credit risk for bilateral transactions, the Company and its counterparties generally enter into master netting agreements based on agreed upon requirements that outline the framework for how collateral is to be posted in the amount owed under each transaction, subject to certain minimums. For over the counter cleared derivative transactions between the Company and a counterparty, the parties enter into a series of master netting and other agreements that govern, among other things, clearing and collateral requirements. These transactions are cleared through a clearinghouse and each derivative counterparty is only exposed to the default risk of the clearinghouse. Certain interest rate swaps and credit default swaps are considered cleared transactions. These cleared transactions require initial and daily variation margin collateral postings. These agreements allow for contracts in a positive position, in which amounts are due to the Company, to be offset by contracts in a negative position. This right of offset, combined with collateral obtained from counterparties, reduces the Company's credit exposure.

Net collateral pledged by the counterparties was \$421 million as of December 31, 2023 and \$2,427 million as of December 31, 2022. In the event of default, the full market value exposure at risk in a net gain position, net of offsets and collateral, was \$309 million as of December 31, 2023 and \$634 million as of December 31, 2022. The statutory net amount at risk, defined as net collateral pledged and statement values excluding accrued interest, was \$5,003 million as of December 31, 2023 and \$5,518 million as of December 31, 2022.

The Company had the right to rehypothecate or repledge securities totaling \$1,444 million of the \$421 million as of December 31, 2023 and \$770 million of the \$2,417 million as of December 31, 2022 of net collateral pledged by counterparties. There were no securities rehypothecated to other counterparties as of December 31, 2023 or December 31, 2022.

The following summarizes the carrying values and notional amounts of the Company's derivative financial instruments:

	December 31, 2023			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps	\$ 17,292	\$ 177,596	\$ 11,922	\$ 128,949
Options	547	11,727	35	248
Currency swaps	2,831	28,593	1,294	14,672
Forward contracts	13	993	301	9,162
Credit default swaps	1	81	153	7,902
Financial futures	56	674	29	257
Total	\$ 20,740	\$ 219,664	\$ 13,734	\$ 161,190

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NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

	December 31, 2022			
	Assets		Liabilities	
	Carrying Value	Notional Amount	Carrying Value	Notional Amount
	(In Millions)			
Interest rate swaps	\$ 18,287	\$ 134,714	\$ 13,036	\$ 136,705
Options	639	14,529	6	-
Currency swaps	3,071	27,615	709	14,814
Forward contracts	14	1,250	236	7,287
Credit default swaps	-	-	13	1,580
Financial futures	21	2,334	3	369
Total	\$ 22,032	\$ 180,442	\$ 14,003	\$ 160,775

The average fair value of outstanding derivative assets was \$22,228 million for the years ended December 31, 2023 and \$18,766 million for the years ended December 31, 2022. The average fair value of outstanding derivative liabilities was \$14,607 million for the years ended December 31, 2023 and \$10,938 million for the years ended December 31, 2022.

The following summarizes the notional amounts of the Company's credit default swaps by contractual maturity:

	December 31, 2023	December 31, 2022
	(In Millions)	
Due after one year through five years	\$ 7,983	\$ 1,580
Total	\$ 7,983	\$ 1,580

The following presents the Company's gross notional interest rate swap positions:

	December 31, 2023	December 31, 2022
	(In Millions)	
Open interest rate swaps in a fixed pay position	\$ 130,853	\$ 128,337
Open interest rate swaps in a fixed receive position	170,817	137,686
Other interest related swaps	4,875	5,396
Total interest rate swaps	\$ 306,545	\$ 271,418

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following summarizes the Company's net realized gains (losses) on closed contracts and change in net unrealized gains (losses) related to market fluctuations on open contracts by derivative type:

	Year Ended December 31, 2023	
	Net Realized Gains (Losses) on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts
	(In Millions)	
Interest rate swaps	\$ (267)	\$ 118
Currency swaps	101	(309)
Options	31	(96)
Credit default swaps	(39)	(24)
Forward contracts	(62)	(66)
Financial futures	(107)	9
Total	\$ (343)	\$ (368)

	Year Ended December 31, 2022	
	Net Realized Gains (Losses) on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts
	(In Millions)	
Interest rate swaps	(717)	846
Currency swaps	69	2,204
Options	(6)	385
Credit default swaps	2	(17)
Forward contracts	853	(222)
Financial futures	(902)	(15)
Total	\$ (702)	\$ 3,181

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
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	Year Ended December 31, 2021	
	Net Realized Gains (Losses) on Closed Contracts	Change In Net Unrealized Gains (Losses) on Open Contracts
	(In Millions)	
Interest rate swaps	\$ (451)	\$ 458
Currency swaps	(25)	1,094
Options	(126)	74
Credit default swaps	2	-
Forward contracts	109	216
Financial futures	(315)	92
Total	\$ (806)	\$ 1,934

The following summarizes gross and net information of derivative assets and liabilities, along with collateral posted in connection with master netting agreements:

	December 31, 2023			December 31, 2022		
	Derivative Assets	Derivative Liabilities	Net	Derivative Assets	Derivative Liabilities	Net
	(In Millions)					
Gross	\$ 20,740	\$ 13,734	\$ 7,006	\$ 22,032	\$ 14,003	\$ 8,029
Due and accrued	1,371	2,387	(1,016)	733	1,689	(956)
Gross amounts offset	(19,063)	(19,063)	-	(15,378)	(15,378)	-
Net asset	3,048	(2,943)	5,990	7,387	314	7,073
Collateral Posted	(3,438)	(3,017)	(421)	(4,821)	(2,394)	(2,427)
Net	\$ (390)	\$ (5,959)	\$ 5,569	\$ 2,566	\$ (2,080)	\$ 4,646

i. Repurchase agreements

The Company had repurchase agreements with carrying values of \$3,221 million as of December 31, 2023 and \$3,042 million as of December 31, 2022. As of December 31, 2023, the maturities of these agreements ranged from January 8, 2024 through March 14, 2024 and the interest rates ranged from 5.52% to 5.6%. The outstanding amounts were collateralized by cash and bonds with a carrying value of \$3,230 million as of December 31, 2023 and \$3,049 million as of December 31, 2022.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following presents the Company's maximum amount and ending balance for repurchase agreements accounted for as secured borrowing for the years ended:

	December 31,			
	2023		2022	
	Maximum balance	Ending balance	Maximum balance	Ending balance
	(In Millions)			
From 1 week to 1 month	\$ 596	\$ -	\$ 773	\$ 398
Greater than 1 month to 3 months	3,247	2,136	3,227	2,644
Greater than 3 months to 1 year	1,088	1,085	1,937	-
Total	\$ 4,931	\$ 3,221	\$ 5,937	\$ 3,042

The following presents the Company's cash collateral and the fair value of security collateral received for the years ended:

	December 31,			
	2023		2022	
	Cash	Securities	Cash	Securities
	(In Millions)			
Total	\$ 69	\$ 16	\$ -	\$ -

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

j. Net investment income

Net investment income, including IMR amortization, comprised the following:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Bonds	\$ 7,275	\$ 5,215	\$ 4,437
Preferred stocks	27	22	17
Common stocks - subsidiaries and affiliates	1,115	878	717
Common stocks - unaffiliated	111	102	55
Mortgage loans	1,102	1,118	1,145
Policy loans	1,058	1,141	1,103
Real estate	70	79	162
Partnerships and LLCs	957	1,014	1,171
Derivatives	(84)	464	539
Cash, cash equivalents and short-term investments	363	80	61
Other	184	35	18
Subtotal investment income	12,178	10,148	9,425
Amortization of the IMR	(51)	(50)	150
Net gains from separate accounts	3	-	-
Investment expenses	(1,087)	(796)	(730)
Net investment income	\$ 11,043	\$ 9,302	\$ 8,845

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

k. Net realized capital (losses) gains

Net realized capital (losses) gains, which include OTTI and are net of deferral to the IMR, comprised the following:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Bonds	\$ (720)	\$ (889)	\$ 199
Preferred stocks	-	(6)	9
Common stocks - subsidiaries and affiliates	24	(13)	10
Common stocks - unaffiliated	15	64	147
Mortgage loans	(73)	(41)	(7)
Real estate	3	127	24
Partnerships and limited liability companies	(314)	(355)	(413)
Derivatives	(344)	(701)	(806)
Other	(7)	(74)	7
Net realized capital losses (gains) before federal and state taxes and deferral to the IMR	(1,416)	(1,888)	(830)
Net federal and state tax benefit (expense)	281	94	(86)
Net realized capital losses before deferral to the IMR	(1,135)	(1,794)	(916)
Net after tax deferred to the IMR	645	2,120	382
Net realized capital (losses) gains	<u>\$ (490)</u>	<u>\$ 326</u>	<u>\$ (534)</u>

OTTI, included in the realized capital losses, consisted of the following:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Bonds	\$ (178)	\$ (416)	\$ (80)
Preferred stock	-	(6)	-
Common stocks- subsidiaries and affiliates	(1)	-	-
Common stocks - unaffiliated	-	(2)	(11)
Mortgage loans	(13)	(4)	(17)
Partnerships and LLCs	(353)	(183)	(483)
Total OTTI	<u>\$ (545)</u>	<u>(611)</u>	<u>(591)</u>

The Company recognized OTTI of \$15 million for the year ended December 31, 2023 and \$14 million for the year ended December 31, 2022 on structured and loan-backed securities, which are included in bonds, primarily due to the present value of expected cash flows being less than the amortized cost.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The Company utilized internally-developed models to determine less than 1% of the \$178 million of bond OTTI for the year ended December 31, 2023, less than 1% of the \$416 million of bond OTTI for the year ended December 31, 2022 and less than 1% of the \$80 million of bond OTTI for the year ended December 31, 2021. The remaining OTTI amounts were determined using external inputs such as publicly observable fair values and credit ratings. Refer to Note 2dd. “*Net realized capital (losses) gains including other-than-temporary impairments and unrealized capital gains (losses)*” for more information on assumptions and inputs used in the Company’s OTTI models.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

6. Federal income taxes

On August 16th, 2022, the Inflation Reduction Act (“IRA”) was signed into law and includes certain corporate income tax provisions. Impacts to the Company could include the imposition of a corporate alternative minimum tax (“CAMT”) applicable to tax years beginning after December 31, 2022. The CAMT imposes a 15% minimum tax on adjusted financial statement income on applicable corporations that have an average group wide adjusted financial statement income over \$1 billion in the prior three-year period (2020-2022). As of the reporting date, the Company has determined that it is not an applicable corporation and therefore not liable for CAMT in 2023. The United States Treasury Secretary and the IRS have been authorized to issue further guidance and intend to publish proposed regulations in 2024.

The Company provides for DTAs in accordance with statutory accounting practices, and has met the required threshold to utilize the three-year reversal period and 15% of surplus limitation.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The net DTA or deferred tax liability (DTL) recognized in the Company's assets, liabilities and surplus is as follows:

	December 31, 2023		
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	\$ 3,943	\$ 740	\$ 4,683
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	3,943	740	4,683
DTAs nonadmitted	(82)	-	(82)
Subtotal net admitted DTA	3,861	740	4,601
Total gross DTLs	(2,009)	(932)	(2,941)
Net admitted DTA(L)	\$ 1,852	\$ (192)	\$ 1,660

	December 31, 2022		
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	\$ 3,444	\$ 742	\$ 4,186
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	3,444	742	4,186
DTAs nonadmitted	-	-	-
Subtotal net admitted DTA	3,444	742	4,186
Total gross DTLs	(2,045)	(912)	(2,957)
Net admitted DTA(L)	\$ 1,399	\$ (170)	\$ 1,229

	Change		
	Ordinary	Capital	Total
	(In Millions)		
Gross DTAs	\$ 499	\$ (2)	\$ 497
Statutory valuation allowance adjustment	-	-	-
Adjusted gross DTAs	499	(2)	497
DTAs nonadmitted	(82)	-	(82)
Subtotal net admitted DTA	417	(2)	415
Total gross DTLs	36	(20)	16
Net admitted DTA(L)	\$ 453	\$ (22)	\$ 431

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The amount of adjusted gross DTA admitted under each component of the guidance and the resulting change by tax character are as follows:

	December 31, 2023		
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	\$ -	\$ 90	\$ 90
Remaining adjusted gross DTAs expected to be realized within 3 years:			
1. Adjusted gross DTA to be realized	1,570	-	1,570
2. Adjusted gross DTA allowed per limitation threshold	4,081	-	4,081
Lesser of lines 1 or 2	1,570	-	1,570
Adjusted gross DTAs offset by existing DTLs	2,291	650	2,941
Total admitted DTA realized within 3 years	\$ 3,861	\$ 740	\$ 4,601
	December 31, 2022		
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	\$ -	\$ 63	\$ 63
Remaining adjusted gross DTAs expected to be realized within 3 years:			
1. Adjusted gross DTA to be realized	1,287	-	1,287
2. Adjusted gross DTA allowed per limitation threshold	4,005	-	4,005
Lesser of lines 1 or 2	1,287	-	1,287
Adjusted gross DTAs offset by existing DTLs	2,158	678	2,836
Total admitted DTA realized within 3 years	\$ 3,445	\$ 741	\$ 4,186
	Change		
	Ordinary	Capital	Total
	(In Millions)		
Admitted DTA 3 years:			
Federal income taxes that can be recovered	\$ -	\$ 27	\$ 27
Remaining adjusted gross DTAs expected to be realized within 3 years:			
1. Adjusted gross DTA to be realized	283	-	283
2. Adjusted gross DTA allowed per limitation threshold	76	-	76
Lesser of lines 1 or 2	283	-	283
Adjusted gross DTAs offset by existing DTLs	133	(28)	105
Total admitted DTA realized within 3 years	\$ 416	\$ (1)	\$ 415

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The Company's total realization threshold limitations are as follows:

	December 31, 2023	December 31, 2022
	(\$ In Millions)	
Ratio percentage used to determine recovery period and threshold limitation	850%	860%
Amount of adjusted capital and surplus used to determine recovery period and threshold limitation above	\$ 27,207	\$ 26,703

The ultimate realization of DTAs depends on the generation of future taxable income during the periods in which the temporary differences are deductible. Management considers the scheduled reversal of DTLs, including the impact of available carryback and carryforward periods, projected taxable income and tax-planning strategies in making this assessment. The impact of tax-planning strategies is as follows:

	December 31, 2023		
	Ordinary	Capital	Total
	(Percent)		
Impact of tax-planning strategies:			
Adjusted gross DTAs (% of total adjusted gross DTAs)	-%	-%	-%
Net admitted adjusted gross DTAs (% of total net admitted adjusted gross DTAs)	79%	-%	79%

	December 31, 2022		
	Ordinary	Capital	Total
	(Percent)		
Impact of tax-planning strategies:			
Adjusted gross DTAs (% of total adjusted gross DTAs)	-%	-%	-%
Net admitted adjusted gross DTAs (% of total net admitted adjusted gross DTAs)	69%	-%	69%

	Change		
	Ordinary	Capital	Total
	(Percent)		
Impact of tax-planning strategies:			
Adjusted gross DTAs (% of total adjusted gross DTAs)	-%	-%	-%
Net admitted adjusted gross DTAs (% of total net admitted adjusted gross DTAs)	10%	-%	10%

There are no reinsurance strategies included in the Company's tax-planning strategies.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The provision for current tax expense on earnings is as follows:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Federal income tax expense (benefit) on operating earnings	\$ 111	\$ (92)	\$ 69
Foreign income tax expense on operating earnings	5	28	3
Total federal and foreign income tax expense (benefit) on operating earnings	116	(64)	72
Federal income tax expense (benefit) on net realized capital gains (losses)	(268)	(106)	43
Total federal and foreign income tax expense (benefit)	<u>\$ (152)</u>	<u>\$ (170)</u>	<u>\$ 115</u>

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The tax effects of temporary differences that give rise to significant portions of the DTAs and DTLs are as follows:

	2023	December 31, 2022	Change
	(In Millions)		
DTAs:			
Ordinary			
Reserve items	\$ 1,779	\$ 1,522	\$ 257
Policy acquisition costs	931	856	75
Nonadmitted assets	320	305	15
Pension and compensation related items	73	49	24
Policyholders' dividends	234	218	16
Investment items	207	224	(17)
Expense items	66	59	7
Other	333	211	122
Total ordinary DTAs	3,943	3,444	499
Nonadmitted DTAs	82	-	82
Admitted ordinary DTAs	3,861	3,444	417
Capital			
Unrealized investment losses	434	397	37
Expense items	18	18	-
Investment items	288	327	(39)
Total capital DTAs	740	742	(2)
Admitted capital DTAs	740	742	(2)
Admitted DTAs	4,601	4,186	415
DTLs:			
Ordinary			
Reserve items	143	212	(69)
Unrealized investment gains	1,128	1,104	24
Deferred and uncollected premium	309	295	14
Pension items	64	68	(4)
Investment items	-	5	(5)
Other	365	361	4
Total ordinary DTLs	2,009	2,045	(36)
Capital			
Unrealized investment gains	808	821	(13)
Investment items	124	91	33
Total capital DTLs	932	912	20
Total DTLs	2,941	2,957	(16)
Net admitted DTA	\$ 1,660	\$ 1,229	\$ 431

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The change in net deferred income taxes comprised the following:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Net DTA(L)	\$ 512	\$ 520	\$ 201
Less: Items not recorded in the change in net deferred income taxes:			
Tax-effect of unrealized gains/(losses)	(38)	105	343
Tax-effect of changes from investment transfers	(12)	37	-
Change in net deferred income taxes	<u>\$ 462</u>	<u>\$ 662</u>	<u>\$ 544</u>

As of December 31, 2023, the Company had no net operating or capital loss carryforwards to include in deferred income taxes. The Company has \$241 million in tax credit carryforwards included in deferred taxes.

The components of federal and foreign income tax are recorded in the Statutory Statements of Operations and the Statutory Statements of Changes in Surplus and are different from those which would be obtained by applying the prevailing federal income tax rate to net gain from operations before federal income taxes. The significant items causing this difference are as follows:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
	21%	21%	21%
Provision computed at federal statutory rate	\$ (175)	\$ (325)	\$ (92)
Expense items	(4)	19	(38)
Foreign governmental income taxes	5	28	3
Investment items	(248)	(188)	(135)
Nonadmitted assets	(15)	(10)	4
Tax credits	(222)	(293)	(95)
Other	45	(63)	(76)
Total statutory income tax benefit	<u>\$ (614)</u>	<u>\$ (832)</u>	<u>\$ (429)</u>
Federal and foreign income tax expense (benefit)	<u>\$ (152)</u>	<u>\$ (170)</u>	<u>\$ 115</u>
Change in net deferred income taxes	(462)	(662)	(544)
Total statutory income tax benefit	<u>\$ (614)</u>	<u>\$ (832)</u>	<u>\$ (429)</u>

The Company received refunds of federal income taxes in the amounts of \$58 million in 2023 and \$5 million in 2022 and paid \$849 million in 2021.

The total income taxes incurred in the current and prior years that will be available for recoupment in the event of future net capital losses totaled \$0 million related to 2023, \$29 million related to 2022, and \$124 million related to 2021.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

MassMutual and its eligible U.S. subsidiaries are included in a consolidated U.S. federal income tax return. MassMutual and its eligible U.S. subsidiaries also file income tax returns in various states and foreign jurisdictions. MassMutual and its eligible U.S. subsidiaries and certain affiliates (the Parties) have executed and are subject to a written tax allocation agreement (the Tax Agreement). The Tax Agreement sets forth the manner in which the total combined federal income tax is allocated among the Parties. The Tax Agreement provides MassMutual with the enforceable right to recoup federal income taxes paid in prior years in the event of future net capital losses, which it may incur. Further, the Tax Agreement provides MassMutual with the enforceable right to utilize its net losses carried forward as an offset to future net income subject to federal income taxes. In accordance with the Tax Agreement, future corporate alternative minimum tax (CAMT) is outside of the scope to the general tax allocation method and, consequently any future CAMT liability shall be allocated solely to MassMutual.

Companies are generally required to disclose unrecognized tax benefits, which are the tax effect of positions taken on their tax returns that may be challenged by various taxing authorities, in order to provide users of financial statements more information regarding potential liabilities. The Company recognizes tax benefits and related reserves in accordance with existing statutory accounting practices for liabilities, contingencies and impairments of assets.

The following is a reconciliation of the beginning and ending liability for unrecognized tax benefits (in millions):

Balance, January 1, 2023	\$	214
Gross change related to positions taken in prior years		-
Gross change related to settlements		-
Gross change related to positions taken in current year		14
Gross change related to lapse of statutes of limitations		-
Balance, December 31, 2023	\$	229

Included in the liability for unrecognized tax benefits as of December 31, 2023, are \$215 million of tax positions for which the ultimate deductibility is highly certain but for which there is uncertainty about the timing of such deductibility. The liability for the unrecognized tax benefits as of December 31, 2023 includes \$9 million of unrecognized tax benefits that, if recognized, would impact the Company's effective tax rate.

The Company recognized an increase of \$8 million in accrued interest related to the liability for unrecognized tax benefits as a component of the provision for income taxes. The amount of net interest recognized was \$32 million as of December 31, 2023 and \$24 million as of December 31, 2022. The Company has no accrued penalties related to the liability for unrecognized tax benefits. In the next year, the Company does not anticipate the total amount of uncertain tax positions to significantly increase or decrease.

The Internal Revenue Service (IRS) has completed its examination of MassMutual and its subsidiaries for the year 2013 and prior. The 2014-2016 tax years are in the process of going to Appeals for 3 carryforward issues. The IRS completed its examination of 2017-2018 tax years and is being transferred to Appeals. The adjustments resulting from these examinations are not expected to materially affect the position or liquidity of the Company.

As of December 31, 2023 and 2022, the Company did not recognize any protective deposits as admitted assets.

7. Other than invested assets

a. Admitted negative (disallowed) IMR

As of December 31, 2023, the Company had \$1,112 million of negative (disallowed) IMR in aggregate and in the general account.

As of December 31, 2023, the Company had \$1,112 million of negative (disallowed) IMR admitted in the general account.

As of December 31, 2023, the calculated adjusted general capital and surplus was \$26,015 million.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

As of December 31, 2023, the percentage of adjusted general capital and surplus for which the admitted disallowed IMR represents was 4%.

The following represents allocated gains (losses) previously deferred to the IMR from derivatives:

	December 31, 2023 (In Millions)
Realized capital gains	2,940
Realized capital losses	(3,935)
Total allocated gains (losses) to IMR from derivatives	\$ (995)

When the Company sells bonds and recognizes losses due to interest-rate related factors, and the realized losses are transferred to the IMR, the sales proceeds are generally used for reinvestment as governed by prudent asset liability management (ALM) policies and procedures. Such sales of bonds are intermittently used to meet liquidity needs and managed within the ALM framework.

IMR losses for fixed income related derivatives were in accordance with documented risk management procedures, as well as the Company's derivative use plans, and reflect the same historical treatment of derivative gains reversed to IMR and amortized rather than immediately recognized as realized gain upon termination.

b. Corporate-owned life insurance

The Company holds corporate-owned life insurance issued by unaffiliated third-party insurers to cover the lives of certain qualified senior employees. The primary purpose of the program is to offset future employee benefit expenses. The Company pays all premiums and is the owner and beneficiary of these policies. The Company had recorded cash surrender values of these policies of \$2,825 million as of December 31, 2023 and \$2,619 million as of December 31, 2022.

The cash surrender value is allocated by the following investment categories:

	December 31,	
	2023	2022
Other invested assets	45%	39%
Bonds	28	32
Stocks	17	16
Cash and short-term investments	7	10
Real estate	3	3
	100%	100%

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

c. Deferred and uncollected life insurance premium

Deferred and uncollected life insurance premium, net of loading and reinsurance, are included in other than invested assets in the Company's Statutory Statements of Financial Position. The following summarizes the deferred and uncollected life insurance premium on a gross basis, as well as, net of loading and reinsurance:

	December 31,			
	2023		2022	
	Gross	Net	Gross	Net
	(In Millions)			
Ordinary new business	\$ 154	\$ 88	\$ 163	\$ 103
Ordinary renewal	1,258	1,220	1,159	1,145
Group life	10	10	10	10
Total	\$ 1,422	\$ 1,318	\$ 1,332	\$ 1,258

Deferred premium is the portion of the annual premium not earned at the reporting date. Loading on deferred premium is an amount obtained by subtracting the valuation net deferred premium from the gross deferred premium and generally includes allowances for acquisition costs and other expenses.

Uncollected premium is gross premium net of reinsurance that is due and unpaid as of the reporting date, net of loading. Net premium is the amount used in the calculation of reserves. The change in deferred and uncollected life insurance premium is included in premium income. The change in loading is included as an expense and is not shown as a reduction to premium income.

Ordinary new business and ordinary renewal business consist of the basic amount of premium required on the underlying life insurance policies.

In certain instances, gross premium is less than net premium according to the standard valuation set by the Division and the Department. The gross premium is less than the net premium needed to establish the reserves because the statutory reserves must use standard conservative valuation mortality tables, while the gross premium calculated in pricing uses mortality tables that reflect both the Company's experience and the transfer of mortality risk to reinsurers. The Company had life insurance in force of \$57,978 million as of December 31, 2023 and \$59,911 million as of December 31, 2022 for which gross premium was less than net premium.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

8. Policyholders' liabilities

a. Policyholders' reserves

The Company had life insurance in force of \$953,410 million as of December 31, 2023 and \$907,462 million as of December 31, 2022.

The following summarizes policyholders' reserves, net of reinsurance, and the range of interest rates by type of product:

	December 31,									
	2023					2022				
	Amount		Interest Rates			Amount		Interest Rates		
	(\$ In Millions)									
Individual life	\$	80,071	2.5%	-	6.0%	\$	74,960	2.5%	-	6.0%
Group annuities		19,737	1.0%	-	11.8%		18,692	1.0%	-	11.8%
Individual universal and variable life		25,346	3.5%	-	6.0%		25,180	3.5%	-	6.0%
Individual annuities		34,055	1.0%	-	11.8%		23,575	1.0%	-	11.8%
Group life		4,178	3.0%	-	4.0%		6,382	3.0%	-	4.0%
Disabled life claim reserves		1,856	3.0%	-	6.0%		1,831	3.0%	-	6.0%
Disability active life reserves		1,504	3.0%	-	6.0%		2,118	3.0%	-	6.0%
Other		503	2.5%	-	6.0%		478	2.5%	-	6.0%
Total	\$	167,250				\$	153,216			

Individual life includes whole life and term insurance. Group life includes corporate-owned life insurance, bank-owned life insurance, group universal life and group variable universal life products. Individual annuities include individual annuity contracts, supplementary contracts involving life contingencies and structured settlements. Group annuities include deferred annuities and single premium annuity contracts. Disabled life claim reserves include disability income and LTC contracts and cover the future payments of known claims. Disability active life reserves include disability income and LTC contracts issued. Other is comprised of disability life and accidental death insurance.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

b. Liabilities for deposit-type contracts

The following summarizes liabilities for deposit-type contracts and the range of interest rates by type of product:

	December 31,									
	2023				2022					
	Amount		Interest Rates		Amount		Interest Rates			
	(In Millions)									
GICs:										
Note programs	\$	12,376	0.6%	-	5.6%	\$	10,813	0.5%	-	5.6%
Federal Home Loan Bank of Boston		2,111	0.8%	-	3.4%		2,111	0.8%	-	3.4%
Municipal contracts		1,720	0.0%	-	7.2%		1,777	0.2%	-	7.3%
Supplementary contracts		2,978	1.0%	-	6.0%		2,909	1.0%	-	6.0%
Dividend accumulations		439	3.0%	-	3.5%		455	3.0%	-	3.0%
Other deposits		21	4.0%	-	8.0%		24	4.0%	-	8.0%
Total	\$	19,645				\$	18,089			

Note program

Funding agreements are investment contracts sold to domestic and international institutional investors. Funding agreement liabilities are equal to the account value and are established by contract deposits, increased by interest credited and decreased by contract coupon payments and maturities. Contract holders do not have the right to terminate the contract prior to the contractually stated maturity date. The Company may retire funding agreements prior to the contractually-stated maturity date by repurchasing the agreement in the market or, in some cases, by calling the agreement. If this occurs, the difference in value is an adjustment to interest credited to liabilities for deposit-type contracts in the Statutory Statements of Operations. Credited interest rates vary by contract and can be fixed or floating. Agreements do not have put provisions or ratings-based triggers. The liability of non-U.S. dollar denominated funding agreements may increase or decrease due to changes in foreign exchange rates. Currency swaps are employed to eliminate foreign exchange risk from all funding agreements issued to back non-U.S. dollar denominated notes.

Under the note program, the Company creates special purpose entities (SPEs), which are investment vehicles or trusts, for the purpose of issuing medium-term notes to investors. Proceeds from the sale of the medium-term notes issued by these SPEs are used to purchase funding agreements from the Company. The payment terms of any particular series of notes are matched by the payment terms of the funding agreement securing the series. Notes are currently issued from the Company's \$16.0 billion Global Medium-Term Note Program.

Federal Home Loan Bank of Boston

MassMutual has funding agreements with Federal Home Loan Bank of Boston (FHLB Boston) in an investment spread strategy, consistent with its other funding agreements. These funding agreements are collateralized by securities with estimated fair values of \$1,955 million as of December 31, 2023. MassMutual's borrowing capacity with FHLB Boston is subject to the lower of the limitation on the pledge of collateral for a loan set forth by law or by MassMutual's internal limit. MassMutual's unused capacity was \$3,889 million as of December 31, 2023. As a member of FHLB Boston, MassMutual held common stock of FHLB Boston with a statement value of \$92 million as of December 31, 2023 and \$92 million as of December 31, 2022.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Municipal contracts

Municipal guaranteed investment contracts (municipal contracts) include contracts that contain terms with above market crediting rates. Liabilities for these contracts includes the municipal contracts' account values, which are established by contract deposits, increased by interest credited (fixed or floating) and decreased by contract coupon payments, additional withdrawals, maturities and amortization of premium. Certain municipal contracts allow additional deposits, subject to restrictions, which are credited based on the rates in the contracts. Contracts have scheduled payment dates and amounts and interest is paid periodically. In addition, certain contracts allow additional withdrawals above and beyond the scheduled payments. These additional withdrawals have certain restrictions on the number per year, minimum dollar amount and are limited to the maximum contract balance. The majority of the municipal contracts allow early contract termination under certain conditions.

Certain municipal contracts contain make-whole provisions, which document the formula for full contract payout. Certain municipal contracts have ratings-based triggers that allow the trustee to declare the entire balance due and payable. Municipal contracts may also have terms that require the Company to post collateral to a third party based on the contract balance in the event of a downgrade in ratings below certain levels under certain circumstances. When the collateral is other than cash, the collateral value is required to be greater than the account balance. The collateral was \$216 million as of December 31, 2023 and \$339 million as of December 31, 2022. The Company employs a rigorous asset/liability management process to help mitigate the economic impacts of various liability risks. By performing asset liability management and performing other risk management activities, the Company believes that these contract provisions do not create an undue level of operating risk to the Company.

Other deposits

Other deposits primarily consist of investment contracts assumed as part of the indemnity reinsurance agreement discussed in *Note 9. "Reinsurance"*. These contracts are used to fund retirement plans. Contract payments are not contingent upon the life of the retirement plan participant.

As of December 31, 2023, the Company's GICs by expected maturity year were as follows (in millions):

2024	\$	2,584
2025		2,790
2026		3,386
2027		1,887
2028		1,689
Thereafter		3,871
Total	\$	16,207

Most GICs only mature on their contractual maturity date. Actual maturities for municipal contracts may differ from their contractual maturity dates, as these contracts permit early contract termination under certain conditions.

c. Unpaid claims and claim expense reserves

The Company establishes unpaid claims and claim expense reserves to provide for the estimated costs of claims for individual disability and LTC policies. These reserves include estimates for both claims that have been reported and those that have been incurred but not reported, and include estimates of all future expenses associated with the processing and settling of these claims. This estimation process is primarily based on the assumption that experience is an appropriate indicator of future events and involves a variety of actuarial techniques that analyze experience, trends and other relevant factors. The amounts recorded for unpaid claims and claim expense reserves represent the Company's best estimate based upon facts and actuarial guidelines. Accordingly, actual claim payouts may vary from these estimates.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following summarizes the changes in disabled life and LTC unpaid claims and claim expense reserves:

	December 31,	
	2023	2022
	(In Millions)	
Claim reserves, beginning of year	\$ 2,232	\$ 2,175
Less: Reinsurance recoverables	367	308
Net claim reserves, beginning of year	1,865	1,867
Claims paid related to:		
Current year	(14)	(14)
Prior years	(333)	(335)
Total claims paid	(347)	(349)
Incurred related to:		
Current year's incurred	375	324
Current year's interest	9	8
Prior year's incurred	(79)	(54)
Prior year's interest	68	69
Total incurred	373	347
Net claim reserves, end of year	1,891	1,865
Reinsurance recoverables	651	367
Claim reserves, end of year	\$ 2,542	\$ 2,232

The changes in reserves for incurred claims related to prior years are generally the result of recent loss development trends. The \$79 million decrease in the prior years' incurred claims for 2023 and the \$54 million decrease in the prior years' incurred claims for 2022 were generally the result of differences between actual termination experience and statutorily prescribed termination tables. In 2023, claim experience included normal claim volume with higher terminations, resulting in a reduction to the incurred reserve from favorable experience, while 2022 claims incurred was due to maturing LTC business partially offset by a corresponding increase in reinsurance recoverable.

The following reconciles disabled life claim reserves to the net claim reserves at the end of the years presented in the previous table. Disabled life claim reserves are recorded in policyholders' reserves. Accrued claim liabilities are recorded in other liabilities.

	December 31,	
	2023	2022
	(In Millions)	
Disabled life claim reserves	\$ 1,856	\$ 1,831
Accrued claim liabilities	33	33
Net claim reserves, end of year	\$ 1,889	\$ 1,864

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

d. Additional liability for annuity contracts

Certain individual variable annuity and fixed index annuity products have additional death or other insurance benefit features, such as GMDBs, GMIBs, GMABs and GLWBs. In general, living benefit guarantees require the contract holder or policyholder to adhere to a company approved asset-allocation strategy. Election of these benefit guarantees is generally only available at contract issue.

The following shows the changes in the liabilities for GMDB, GMIB, GMAB and GLWB (in millions):

Liability as of January 1, 2022	\$	42
Incurred guarantee benefits		18
Paid guarantee benefits		(5)
Liability as of December 31, 2022		55
Incurred guarantee benefits		2
Paid guarantee benefits		(8)
Liability as of December 31, 2023	\$	49

The following summarizes the account values, net amount at risk and weighted average attained age for variable annuity contracts with GMDB, GMIB, GMAB and GLWB classified as policyholders' reserves and separate account liabilities. The net amount at risk is defined as the minimum guarantee less the account value calculated on a policy-by-policy basis, but not less than zero.

	December 31, 2023			December 31, 2022		
	Account Value	Net Amount at Risk	Weighted Average Attained	Account Value	Net Amount at Risk	Weighted Average Attained
	(\$ In Millions)					
GMDB	\$ 8,572	\$ 25	66	\$ 8,685	\$ 199	66
GMIB Basic	449	7	73	466	21	72
GMIB Plus	1,240	448	69	1,198	505	68
GMAB	1,400	20	63	1,552	84	62
GLWB	94	15	75	97	22	74

As of December 31, 2023, the GMDB account value above consists of \$3,712 million of Modco assumed within the separate accounts. As of December 31, 2022, the GMDB account value above consists of \$3,600 million of Modco assumed within the separate accounts.

Account values of variable annuity contracts with GMDB, GMIB, GMAB and GLWB are summarized below:

	December 31, 2023			December 31, 2022		
	Separate Account	General Account	Total	Separate Account	General Account	Total
	(In Millions)					
GMDB	\$ 7,437	\$ 1,135	\$ 8,572	\$ 7,426	\$ 1,259	\$ 8,685
GMIB Basic	434	15	449	445	21	466
GMIB Plus	1,240	-	1,240	1,198	-	1,198
GMAB	1,368	32	1,400	1,516	37	1,553
GLWB	94	-	94	97	-	97

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

e. Additional liability for individual life contracts

Certain universal life and variable universal life contracts include features such as GMDBs or other guarantees that ensure continued death benefit coverage when the policy would otherwise lapse. The value of the guarantee is only available to the beneficiary in the form of a death benefit.

The following presents the changes in the liability, net of reinsurance, for guarantees on universal life and variable universal life type contracts:

	December 31,	
	2023	2022
	(In Millions)	
Beginning balance	\$ 5,154	\$ 4,601
Net liability increase	332	553
Ending balance	<u>\$ 5,486</u>	<u>\$ 5,154</u>

9. Reinsurance

The Company enters into reinsurance agreements with affiliated and unaffiliated insurers in the normal course of business in order to mitigate the impact of underwriting mortality and morbidity risks or to assume business. Such transfers do not relieve the Company of its primary liability to its customers and, as such, failure of reinsurers to honor their obligations could result in credit losses that could arise if a reinsurer defaults. The Company reduces reinsurance default risk by evaluating the financial condition of reinsurers and monitoring for possible concentrations within the Company's reinsurers and using trust structures, when appropriate. The Company reinsures a portion of its mortality risk in its life business under either a first dollar quota-share arrangement or an in excess of the retention limit arrangement with reinsurers. The Company also reinsures a portion of its morbidity risk in its disability and LTC business. The amounts reinsured are on a yearly renewable term, coinsurance funds withheld, coinsurance or Modco basis. The Company's highest retention limit for new issues of life policies ranges from \$15 million to \$35 million.

Refer to *Note 17. "Related party transactions"* for information about the Company's affiliated assumed reinsurance transactions.

There are no reinsurance agreements in effect under which the reinsurer may unilaterally cancel any reinsurance for reasons other than for nonpayment of premium or other similar credits. The Company has no reinsurance agreements in effect such that the amount of losses paid or accrued through the statement date may result in a payment to the reinsurer of amounts which, in aggregate and allowing for offset of mutual credits from other reinsurance agreements with the same reinsurer, exceed the total direct premium collected under the reinsured policies.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Reinsurance amounts included in the Statutory Statements of Operations were as follows:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Direct premium	\$ 34,223	\$ 35,530	\$ 30,907
Premium assumed	977	1,013	1,112
Premium ceded	(9,711)	(13,019)	(12,128)
Total net premium	\$ 25,490	\$ 23,524	\$ 19,891
Ceded reinsurance recoveries	\$ 1,842	\$ 1,540	\$ 1,699
Assumed losses	\$ 425	\$ 330	\$ 356

Reinsurance amounts included in the Statutory Statements of Financial Position were as follows:

	December 31,	
	2023	2022
	(In Millions)	
Reinsurance reserves:		
Assumed	\$ 6,476	\$ 551
Ceded	(47,326)	(47,416)
Ceded amounts recoverable	\$ 324	\$ 329
Benefits payable on assumed business	\$ 65	\$ 40
Funds held under coinsurance		
Ceded	\$ 22,520	\$ 21,916

Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2023 include \$9,219 million associated with life insurance policies, \$6,497 million for LTC, \$22,659 million for annuity, \$14 million for disability and \$6 million for group life and health. Reinsurance reserves ceded to unaffiliated reinsurers as of December 31, 2022 include \$9,016 million associated with life insurance policies \$5,998 million for LTC, \$32,381 million for annuity, \$15 million for disability and \$6 million for group life and health.

For the year ended December 31, 2023, the Company decreased its gross LTC policyholders' premium deficiency reserve by \$590 million primarily through a combination of various assumption changes to reflect the risk inherent in the cash flows of this business. The majority of the risk is ceded to unaffiliated reinsurers resulting in the ceded policyholders' premium deficiency reserves decreasing by \$295 million. The total net impact of the change is \$295 million, which was recorded as a decrease to policyholders' liabilities on the Statutory Statements of Financial Position and a decrease to change in policyholders' reserves on the Statutory Statements of Operations.

For the year ended December 31, 2022, the Company decreased its gross LTC policyholders' premium deficiency reserve by \$165 million primarily through a combination of various assumption changes to reflect the risk inherent in the cash flows of this business. The majority of the risk is ceded to unaffiliated reinsurers resulting in the ceded policyholders' premium deficiency reserves decreasing by \$345 million. The total net impact of the change is \$180 million, which was recorded as an increase to policyholders' liabilities on the Statutory Statements of Financial Position and an increase to change in policyholders' reserves on the Statutory Statements of Operations.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

	December 31, 2023		
	(In Millions)		
	Direct	Ceded	Net
LTC premium deficiency reserves, beginning of year	\$ 4,390	\$ (3,910)	\$ 480
Assumption changes	(590)	295	(295)
LTC premium deficiency reserves, end of year	<u>\$ 3,800</u>	<u>\$ (3,615)</u>	<u>\$ 185</u>

As of December 31, 2023, one reinsurer accounted for 29% of the outstanding balance of the reinsurance recoverable and the next largest reinsurer had 21%. The Company continues to monitor its morbidity risk ceded to one reinsurer for its LTC business, in which 72% of the reserves are held in trust.

On July 5, 2023, the Company recaptured approximately \$16 million of statutory reserves reinsured on a yearly renewable term (YRT) basis for certain closed blocks of LTC business and reinsured on a coinsurance basis a portion of this product resulting in ceding \$692 million statutory reserves to a different reinsurer. The recapture settlement of \$17 million relieved the reinsurer of all obligations under the YRT agreement and resulted in an offset to premiums and disability benefits. As part of the coinsurance transaction, the Company transferred \$657 million of premium to the reinsurer.

The Company holds invested assets associated with funds withheld that are managed externally, as of December 31, 2023 and 2022, these assets, at carry value, included:

	December 31,	
	2023	2022
	(In Millions)	
Bonds	\$ 15,215	\$ 14,955
Preferred stocks	79	70
Mortgage loans	1,043	1,473
Partnerships and LLCs	51	126
Cash, cash equivalents and short-term investments	946	361
Total	<u>\$ 17,334</u>	<u>\$ 16,985</u>

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

10. Withdrawal characteristics

a. Annuity actuarial reserves and liabilities for deposit-type contracts

The withdrawal characteristics of the Company's annuity actuarial reserves and deposit-type contracts as of December 31, 2023 are illustrated below:

Individual annuities

	General Account	Separate Account with Guarantees	Separate Account Non- Guaranteed	Total	% of Total
	(In Millions)				
Subject to discretionary withdrawal:					
With market value adjustment	\$ 570	\$ -	\$ -	\$ 570	1%
At book value less current surrender charge of 5% or more	32,552	-	-	32,552	61
At fair value	-	-	8,058	8,058	15
Total with market value adjustment or at fair value	33,122	-	8,058	41,180	77
At book value without adjustment (minimal or no charge or adjustment)	3,905	-	-	3,905	7
Not subject to discretionary withdrawal	8,302	-	-	8,302	16
Total	\$ 45,329	\$ -	\$ 8,058	\$ 53,387	100%
Reinsurance ceded	11,323	-	-	11,323	
Total, net of reinsurance	\$ 34,006	\$ -	\$ 8,058	\$ 42,064	
Amount included in book value moving to at book value without adjustment after statement date	1,304	-	-	1,304	

Group annuities

	General Account	Separate Account with Guarantees	Separate Account Non- Guaranteed	Total	% of Total
	(In Millions)				
Subject to discretionary withdrawal:					
With market value adjustment	\$ 13,547	\$ -	\$ -	\$ 13,547	20%
At fair value	-	10,694	20,623	31,317	45
Total with market value adjustment or at fair value	13,547	10,694	20,623	44,864	65
At book value without adjustment (minimal or no charge or adjustment)	311	376	-	687	1
Not subject to discretionary withdrawal	23,544	-	-	23,544	34
Total	\$ 37,402	\$ 11,070	\$ 20,623	\$ 69,095	100%
Reinsurance ceded	17,690	-	-	17,690	
Total, net of reinsurance	\$ 19,712	\$ 11,070	\$ 20,623	\$ 51,405	

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Deposit-type contracts

	General Account	Separate Account with Guarantees	Separate Account Non- Guaranteed	Total	% of Total
	(In Millions)				
Subject to discretionary withdrawal:					
With market value adjustment	\$ 2,479	\$ -	\$ -	\$ 2,479	8%
At fair value	-	-	9,332	9,332	30
Total with market value adjustment or at fair value	2,479	-	9,332	11,811	38
At book value without adjustment (minimal or no charge or adjustment)	2,704	-	-	2,704	8
Not subject to discretionary withdrawal	17,038	-	-	17,038	54
Total	\$ 22,221	\$ -	\$ 9,332	\$ 31,553	100%
Reinsurance ceded	2,576	-	-	2,576	
Total, net of reinsurance	\$ 19,645	\$ -	\$ 9,332	\$ 28,977	

The following is a summary of total annuity actuarial reserves and liabilities for deposit-type contracts as of December 31, 2023 (in millions):

Statutory Statements of Financial Position:	
Policyholders' reserves – group annuities	\$ 19,712
Policyholders' reserves – individual annuities	34,005
Liabilities for deposit-type contracts	19,645
Subtotal	73,362
Separate Account Annual Statement:	
Annuities	39,751
Other annuity contract deposit-funds and GICs	9,332
Subtotal	49,083
Total	\$ 122,445

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

b. Analysis of life actuarial reserves by withdrawal characteristics

The withdrawal characteristics of the Company's life actuarial reserves as of December 31, 2023 are illustrated below:

General Account

	Account Value	Cash Value	Reserve
	(In Millions)		
Subject to discretionary withdrawal, surrender values, or policy loans:			
Universal life	\$ 22,384	\$ 22,381	\$ 22,439
Universal life with secondary guarantees	1,710	1,520	7,088
Other permanent cash value life insurance	-	79,893	84,398
Variable life	1	1	1
Variable universal life	888	886	938
Not subject to discretionary withdrawal or no cash values:			
Term policies without cash value	-	-	2,971
Accidental death benefits	-	-	3
Disability - active lives	-	-	192
Disability - disabled lives	-	-	311
Miscellaneous reserves	-	-	975
Total (gross: direct + assumed)	\$ 24,983	\$ 104,681	\$ 119,316
Reinsurance Ceded	4,479	5,166	9,219
Total (net)	\$ 20,504	\$ 99,515	\$ 110,097

Separate Account with Guarantees

	Account Value	Cash Value	Reserve
	(In Millions)		
Subject to discretionary withdrawal, surrender values, or policy loans:			
Variable universal life	\$ 1,549	\$ 1,549	\$ 1,549
Not subject to discretionary withdrawal or no cash values:			
Total (gross: direct + assumed)	1,549	1,549	1,549
Total (net)	\$ 1,549	\$ 1,549	\$ 1,549

Separate Account Nonguaranteed

	Account Value	Cash Value	Reserve
	(In Millions)		
Subject to discretionary withdrawal, surrender values, or policy loans:			
Variable life	\$ 1	\$ 1	2
Variable universal life	1,657	1,629	1,645
Not subject to discretionary withdrawal or no cash values:			
Total (gross: direct + assumed)	1,658	1,630	1,647
Total (net)	\$ 1,658	\$ 1,630	\$ 1,647

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

c. Separate accounts

The Company has guaranteed separate accounts classified as the following: nonindexed, which have multiple concurrent guarantees, including a guarantee that applies for as long as the contract is in effect and does not exceed a 4% rate of return. The Company has nonguaranteed separate accounts which are variable accounts where the benefit is determined by the performance and/or market value of the investments held in the separate account with incidental risk, notional expense and minimum death benefit guarantees.

Information regarding the separate accounts of the Company as of and for the year ended December 31, 2023 is as follows:

	Guaranteed			
	Nonindexed Less Than/ Equal to		Non Guarantee	Total
	Indexed			
	(In Millions)			
Net premium, considerations or deposits for the year ended December 31, 2023	\$ -	\$ -	\$ 4,769	\$ 4,769
Reserves at December 31, 2023:				
For accounts with assets at:				
Fair value	\$ -	\$ 11,447	\$ 39,284	\$ 50,731
Amortized cost/book value	-	1,549	-	1,549
Subtotal SIA Reserves	-	12,996	39,284	52,280
Nonpolicy liabilities	-	-	175	175
Total Separate Account Liabilities	\$ -	\$ 12,996	\$ 39,459	\$ 52,455
Reserves by withdrawal characteristics:				
Subject to discretionary withdrawal:				
At fair value	\$ -	\$ 11,447	\$ 39,284	\$ 50,731
At book value without market value adjustment and current surrender charge of less than 5%	-	1,549	-	1,549
Subtotal	-	12,996	39,284	52,280
Nonpolicy liabilities	-	-	175	175
Total Separate Account Liabilities	\$ -	\$ 12,996	\$ 39,459	\$ 52,455

The Company does not have any reserves in separate accounts for asset default risk in lieu of AVR.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following is a reconciliation of amounts reported as transfers (from) to separate accounts in the Summary of Operations of the Company's NAIC Separate Account Annual Statement to the amounts reported as net transfers (from) to separate accounts in change in policyholders' reserves in the accompanying Statutory Statements of Operations:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
From the Separate Account Annual Statement:			
Transfers to separate accounts	\$ 1,935	\$ 4,205	\$ 3,971
Transfers from separate accounts	(9,387)	(14,220)	(11,152)
Subtotal	(7,452)	(10,015)	(7,181)
Reconciling adjustments:			
Miscellaneous	4,278	3,481	4,537
Net deposits on deposit-type liabilities	1,573	1,939	1,202
Net transfers from separate accounts	\$ (1,601)	\$ (4,595)	\$ (1,442)

Net deposits on deposit-type liabilities are not considered premium and therefore are excluded from the Statutory Statements of Operations.

11. Debt

MassMutual issues commercial paper in the form of Notes in minimum denominations of \$250 thousand up to a total aggregation of \$1,000 million with maturity dates up to a maximum of 270 days from the date of issuance. Noninterest bearing Notes are sold at par less a discount representing an interest factor. Interest bearing Notes are sold at par. The Notes are not redeemable or subject to voluntary prepayments by MassMutual. The Notes have a carrying value and face amount of \$50 million as of December 31, 2023 and \$250 million as of December 31, 2022. Notes issued in 2023 had interest rates ranging from 4.36% to 5.40% with maturity dates ranging from 1-36 days. Interest expense for commercial paper was \$7 million for the year ended December 31, 2023 and \$5 million for the year ended December 31, 2022.

MassMutual has a \$1,500 million, five-year credit facility, with a syndicate of lenders that can be used for general corporate purposes and to support commercial paper borrowings. During December 2022, the facility was renewed and the scheduled maturity is December 16, 2027. The facility includes two one-year extension options that may be exercised with proper notification as set forth in the agreement. The facility has an upsize option for an additional \$500 million. The terms of the credit facility additionally provide for, among other provisions, covenants pertaining to liens, fundamental changes, transactions with affiliates and adjusted statutory surplus. As of and for the years ended December 31, 2023 and 2022, MassMutual was in compliance with all covenants under the credit facility. For the years ended December 31, 2023 and 2022, there were no draws on the credit facilities. Credit facility fees were less than \$1 million for the years ended December 31, 2023 and December 31, 2022.

12. Employee benefit plans

The Company sponsors multiple employee benefit plans, providing retirement, life, health and other benefits to employees, certain employees of unconsolidated subsidiaries, agents, general agents and retirees who meet plan eligibility requirements.

a. Pension plans

The Company sponsors funded and unfunded noncontributory defined benefit pension plans for its eligible employees, agents and retirees.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The funded qualified defined benefit plan generally provides benefits under a cash balance formula based on age, service and salary during the participants' careers. Certain eligible participants may be entitled to benefits under a legacy defined benefit formula. The Company's policy is to fund the qualified pension plan in accordance with the Employee Retirement Income Security Act of 1974. There were no contributions in 2023 and 2022.

b. Defined contribution plans

The Company sponsors funded qualified defined contribution plans and unfunded nonqualified deferred compensation thrift savings plans for its employees, agents and retirees. Defined contribution plan expense for 2023 and 2022 was \$56 million and \$52 million, respectively.

c. Other postretirement benefits

The Company provides certain life insurance and health care benefits (other postretirement benefits) for its retired employees and agents, their beneficiaries and covered dependents. MMHLLC has the obligation to pay the Company's other postretirement benefits. The transfer of this obligation to MMHLLC does not relieve the Company of its primary liability. MMHLLC is allocated other postretirement expenses related to interest cost, amortization of actuarial gains (losses) and expected return on plan assets, whereas service cost and prior service cost are recorded by the Company.

Substantially all of the Company's U.S. employees and agents may become eligible to receive other postretirement benefits. These benefits are funded as the benefits are provided to the participants. For eligible employees who retire after 2009, except certain employees who were close to retirement in 2010, the Company's cost is limited to a retiree health reimbursement account (RHRA), which accumulates during an employee's career and can be drawn down by the retiree to purchase coverage outside of the Company or for other health care costs. Retired employees with a RHRA also may choose to purchase coverage through the private retiree exchange.

For other eligible current and future retired employees, and current and future retired agents, the Company provides access to postretirement health care plans through a private retiree exchange. The Company's cost is limited to the fixed annual subsidy provided to retirees through a Health Reimbursement Account each year that the retiree can use to purchase coverage on the exchange or for other health care costs.

Company-paid basic life insurance is provided to retirees who retired before 2010 and certain employees who retire after 2009 but were close to retirement in 2010. Supplemental life insurance is available to certain retirees on a retiree-pay-all basis.

The Company provides retiree life insurance coverage for home office employees who, as of January 1, 2010, were age 50 with at least 10 years of service or had attained 75 points, generally age plus service, with a minimum 10 years of service.

d. Benefit obligations

Accumulated and projected benefit obligations are the present value of pension benefits earned as of a December 31 measurement date (the Measurement Date) based on service and compensation as of that date.

Refer to *Note 12f. "Amounts recognized in the Statutory Statements of Financial Position,"* for details on the funded status of the plans. Accumulated and projected postretirement benefit obligations for other postretirement benefits are the present value of postretirement medical and life insurance benefits earned as of the Measurement Date projected for estimated salary increases to an assumed date with respect to retirement, disability or death.

Actuarial (gains) losses represent the difference between the expected results and the actual results used to determine the projected benefit obligation, accumulated benefit obligation and current year expense. Select assumptions used in this calculation include expected future compensation levels, mortality and expected retirement age.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following presents the total pension and other postretirement accumulated benefit obligation:

	December 31,			
	2023	2022	2023	2022
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Accumulated benefit obligation	\$ 2,634	\$ 2,590	\$ 313	\$ 315

The following sets forth the change in projected benefit obligation of the defined benefit pension and other postretirement plans:

	December 31,			
	2023	2022	2023	2022
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Projected benefit obligation, beginning of year	\$ 2,590	\$ 3,099	\$ 315	\$ 374
Service cost	86	97	7	10
Interest cost	125	86	15	11
Actuarial (gains) losses	21	44	(14)	(10)
Benefits paid	(222)	(180)	(14)	(14)
Change in discount rate	34	(565)	4	(56)
Change in actuarial assumptions	-	9	-	-
Projected benefit obligation, end of year	<u>\$ 2,634</u>	<u>\$ 2,590</u>	<u>\$ 313</u>	<u>\$ 315</u>

The determination of the discount rate is based upon rates commensurate with current yields on high quality corporate bonds as of the Measurement Date. A spot yield curve is developed from this data that is used to determine the present value for the obligation. The projected plan cash flows are discounted to the Measurement Date based on the spot yield curve. A single discount rate is utilized to ensure the present value of the benefits cash flow equals the present value computed using the spot yield curve. A 25-basis point change in the discount rate results in approximately a \$59 million change in the projected pension benefit obligation. The methodology includes producing a cash flow of annual accrued benefits. Refer to Note 12h. "Assumptions" for details on the discount rate.

e. Plan assets

The assets of the qualified pension plan are invested in a MassMutual group annuity contract and in the MassMutual Pension Plan Trust (Pension Trust). The group annuity contract includes a general investment account (GIA). As of December 31, 2023 and 2022, GIA assets managed by the Company were \$229 million and \$168 million, respectively. The Company was rated AA+ by Standards and Poor's as of December 31, 2023..

The Company's overall objective is to manage the assets in a liability framework where investments are selected that are expected to have similar changes in fair value as the related liabilities will have upon changes in interest rates. The company invests in a portfolio of both return-seeking and liability-hedging assets, to achieve long-term growth and to insulate the funded position from interest rate volatility.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The target range allocations are based on two broad categories, return-seeking (generally equities and alternative investments) and liability-hedging (generally fixed income). The return-seeking allocation range is 46% to 54% and liability-hedging range is 46% to 54%. Of the return-seeking assets, the range is 35% to 55% global public equity and 45% to 65% alternatives. The pension plan assets invested in the GIA through the unallocated group annuity contract earn a fixed interest. These assets comprised approximately 9% of the plan assets as of December 31, 2023 and 7% as of December 31, 2022.

The following presents the change in plan assets:

	2023	December 31, 2022	2023	2022
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Plan assets, beginning of year	\$ 2,483	\$ 3,053	\$ 2	\$ 2
Actual return on plan assets	230	(415)	-	-
Employer contributions	30	25	14	14
Benefits paid	(222)	(180)	(14)	(14)
Other	-	-	2	-
Plan assets, end of year	<u>\$ 2,521</u>	<u>\$ 2,483</u>	<u>\$ 4</u>	<u>\$ 2</u>

The GIA is designed to provide stable, long-term investment growth. Investments in the GIA are stated at contract value. Contract value is the amount participants would receive if they were to initiate certain transactions under the terms of the plan. It provides for a stated return on principal invested over a specified period and permits withdrawals at contract value for benefit payments, loans, or transfers.

Investments in the Pension Trust are stated at fair value. Noninterest bearing cash is stated at cost value.

Fair Value Measurements

The Company's fair value hierarchy is defined in *Note 4. "Fair Value of financial instruments"*.

The following is a description of the valuation methodologies used to measure fair value for the investments in the qualified pension plan.

Cash, cash equivalents and short-term investments: Short-term investments are stated at cost, which is equal to fair value. Foreign currencies are stated at cost and adjusted for foreign currency gains and losses.

Government securities: Marked to market daily based on values provided by third-party vendors or market makers to the extent available or based on model prices. Valuations furnished by a pricing service take into account factors such as institutional-size trading in similar securities, yield, quality, coupon rate, maturity, type of issue, trading characteristics, and other market data and are therefore classified as Level 2.

Bonds: If Level 1 valuations are not available, the fair value is determined using models such as matrix pricing and therefore, is classified as Level 2, which uses quoted market prices of debt securities with similar characteristics. Valued using the closing price reported on the active market on which the individual securities are traded.

Mutual funds: Mutual funds are valued at the daily closing price as reported by the fund. Certain mutual funds held by the plan are registered with the SEC and are required to publish their daily NAV. These mutual funds held by the Plan are deemed to be actively traded and are therefore classified as Level 1. The remaining mutual funds do not publish their daily NAV and are therefore classified as Level 2.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Collective investment trusts: Valued using the NAV per unit. The net asset value per unit of the funds is calculated on each business day by dividing the total value of assets, less liabilities, by the number of units outstanding. Unit issuances and redemptions are based on the net asset value determined at the end of the current day and therefore is classified as NAV practical expedient.

Real estate investment trusts: Real estate investment trusts are valued using the plan's pro-rata interest in the fund and does not have a lock-up period, a funding commitment, or a specific redemption period but are dependent upon the liquidation of underlying assets. Therefore, these investments are classified as NAV practical expedient.

Hedge funds: Hedge funds are based on the plan's pro rata interest in the fund and have a 45-day redemption period and therefore classified as NAV practical expedient.

Limited partnerships – Private equity/venture capital: The plan utilizes the NAV practical expedient to calculate fair value of its investments based on the Plan's pro rata interest in net assets of each underlying partnership. All valuations utilize financial information supplied by the partnership, including income, expenses, gains and losses. The underlying investments are accounted for at fair value as described in the partnership's audited financial statements. These funds can be redeemed periodically with notice that generally ranges from 45 to 90 days. There are no lockups or funding commitments.

Limited partnerships – Real estate: The plan utilizes the NAV practical expedient to calculate fair value of its investments based on the Plan's pro rata interest in net assets of each underlying partnership. All valuations utilize financial information supplied by the partnership, including income, expenses, gains and losses. The underlying investments of the partnership are accounted for at fair value as described in the partnership's audited financial statements. These funds can be redeemed periodically with notice that generally ranges from 45 to 90 days. There are no lockups or funding commitments.

Limited partnerships – Hedge: The Plan utilizes the NAV practical expedient to calculate fair value of its investments based on the Plan's pro rata interest in net assets of each underlying partnership. All valuations utilize financial information supplied by the partnership, including income, expenses, gains and losses. The underlying investments of the partnership are accounted for at fair value as described in the partnership's audited financial statements. The hedge funds can be redeemed semi-annually with 95 days' notice. There are no lockups or funding commitments.

Other investments: Investments included in this category include asset backed securities, mortgage backed securities, swaps, derivatives, futures and options. Closing prices are not available on the active market. Fair value is determined using models such as matrix pricing and therefore, these securities are classified as Level 2.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following tables set forth by level, within the fair value hierarchy, the plan's assets at fair value as of December 31, 2023 and 2022.

	Fair Value as of December 31, 2023				
	Level 1	Level 2	Level 3	NAV	Total
				Practical Expedient	
	(In Millions)				
Cash, cash equivalents, and short-term investments	\$ 76	-	-	-	76
Government securities	-	486	-	-	486
Bonds	-	371	-	-	371
Mutual funds	471	-	-	-	471
Real estate investment trusts	-	-	-	54	54
Hedge funds	-	-	-	31	31
Limited partnerships					
Private equity/venture capital	-	-	-	480	480
Real estate	-	-	-	120	120
Hedge	-	-	-	205	205
Other investments	-	12	-	-	12
Total	\$ 547	\$ 869	\$ -	\$ 890	\$ 2,306

Plan assets measured at contract value and non-interest bearing cash are excluded from the preceding table.

	Fair Value as of December 31, 2022				
				NAV Practical Expedient	
	Level 1	Level 2	Level 3		Total
	(In Millions)				
Cash, cash equivalents, and short-term investments	\$ 5	\$ 24	\$ -	\$ -	\$ 29
Mutual funds	458	293	-	-	751
Collective investment trusts	-	63	-	-	63
Hedge funds	-	-	-	27	27
Limited partnerships					
Private equity/venture capital	-	-	-	414	414
Real estate	-	-	-	135	135
Hedge	-	-	-	185	185
Debt Instruments:					
Corporate and other bonds	-	331	-	-	331
Other:					
Government securities	-	378	-	-	378
Other	-	2	-	-	2
Total pension trust assets	\$ 463	\$ 1,091	\$ -	\$ 761	\$ 2,315
Total General Investment Account	-	-	168	-	168
Total	\$ 463	\$ 1,091	\$ 168	\$ 761	\$ 2,483

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

f. Amounts recognized in the Statutory Statements of Financial Position

Unrecognized prior service cost is the adjustment to the projected benefit obligation as a result of plan amendments. It represents the increase or decrease in benefits for service performed in prior periods. For pension benefits, this cost is amortized into net periodic benefit cost over the average remaining service years of active employees at the time of the amendment. For other postretirement benefits, this cost is amortized into net periodic benefit cost over the average remaining lifetime of eligible employees and retirees at the time of the amendment.

Unrecognized net actuarial (gains) losses are variances between assumptions used and actual experience. These assumptions include return on assets, discount rate, demographics and mortality. The unrecognized net actuarial (gains) losses are amortized if they exceed 10% of the projected benefit obligation and are amortized starting in the period after recognition. These are amortized for pension and other postretirement benefits into net periodic benefit cost over the remaining service-years of active employees.

The prepaid pension asset is a cumulative balance of employer contributions made to the plan netted against the plan's accumulated net periodic benefit costs. The prepaid pension asset is a nonadmitted asset.

The accrued benefit cost recognized is the funded status of the plan adjusted for the remaining balance of unrecognized prior service cost, unrecognized net actuarial loss and the nonadmitted prepaid pension asset.

The following sets forth the projected benefit obligation funded status of the plans:

	December 31,			
	2023	2022	2023	2022
	Pension Benefits		Other Postretirement Benefits	
	(In Millions)			
Projected benefit obligation	\$ (2,634)	\$ (2,590)	\$ (313)	\$ (315)
Plan assets	2,521	2,483	4	2
Projected benefit obligation funded status	\$ (113)	\$ (107)	\$ (309)	\$ (313)

The qualified pension plan was overfunded by \$312 million as of December 31, 2023 and \$296 million as of December 31, 2022. The nonqualified pension plans are not funded and have total projected benefit obligations of \$425 million as of December 31, 2023 and \$403 million as of December 31, 2022.

The qualified pension plan nonadmitted pension plan asset was \$653 million as of December 31, 2023 and \$678 million as of December 31, 2022.

The Company intends to fund \$56 million in 2024 to meet its expected current obligations under its qualified and nonqualified pension plans and other postretirement benefit plans.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

g. Net periodic cost

The net periodic cost represents the annual accounting income or expense recognized by the Company and is included in general insurance expenses in the Statutory Statements of Operations. The net periodic cost recognized is as follows:

	Years Ended December 31,						
	2023	2022	2021	2023	2022	2021	
	Pension Benefits			Other Postretirement Benefits			
	(In Millions)						
Service cost	\$ 86	\$ 97	\$ 110	\$ 7	\$ 9	\$ 10	
Interest cost	125	86	77	15	10	9	
Expected return on plan assets	(169)	(194)	(183)	-	-	-	
Amortization of unrecognized (gains) and losses	27	9	39	(9)	(1)	-	
Amortization of unrecognized prior service benefit	-	-	-	(5)	(6)	(6)	
Total net periodic cost/(benefit)	\$ 69	\$ (2)	\$ 43	\$ 8	\$ 12	\$ 13	

The expected future pension and other postretirement benefit payments which reflect expected future service are as follows:

	Pension Benefits	Other Postretirement Benefits
	(In Millions)	
2024	\$ 199	\$ 19
2025	201	20
2026	206	20
2027	204	21
2028	209	21
2029-2033	1,055	109

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

h. Assumptions

The assumptions the Company used to calculate the benefit obligations and to determine the benefit costs are as follows:

	Years Ended December 31,					
	2023	2022	2021	2023	2022	2021
	Pension Benefits			Other Postretirement Benefits		
Weighted-average assumptions used to determine:						
Benefit obligations:						
Discount rate	4.85%	5.00%	2.85%	4.85%	5.05%	2.80%
Expected rate of compensation increase	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%
Interest Crediting rate	5.00%	5.00%	5.00%	4.85%	5.05%	2.80%
Net periodic benefit cost:						
Discount rate	5.00%	2.85%	2.50%	5.05%	2.80%	2.45%
Expected long-term rate of return on plan assets	7.00%	6.50%	6.50%	3.00%	3.00%	3.00%
Expected rate of compensation increase	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%
Interest Crediting rate	5.00%	5.00%	5.00%	5.05%	2.80%	2.45%

The discount rate used to determine the benefit obligations as of year end is used to determine the expense in the next fiscal year.

The Company determines its assumptions for the expected rate of return on plan assets for its plans using a “building block” approach, which focuses on ranges of anticipated rates of return for each asset class. A weighted range of nominal rates is determined based on target allocations for each class of asset.

13. Employee compensation plans

The Company has a long-term incentive compensation plan under which certain employees of the Company and its subsidiaries may be issued phantom stock-based compensation awards. These awards include PSARs and PRS. These awards do not grant an equity or ownership interest in the Company.

A summary of the weighted average grant price of PSARs and PRS shares granted, the intrinsic value of PSARs shares exercised, the PRS liabilities paid and the fair value of shares vested during the year is as follows:

	December 31,		
	2023	2022	2021
Weighted average grant date fair value:			
PSARs granted during the year	\$ 145.77	\$ 243.40	\$ 141.86
PRS granted during the year	145.67	238.54	153.38
Intrinsic value (in thousands):			
PSARs options exercised	65,810	135,219	124,551
PRS liabilities paid	45,600	70,029	48,298
Fair value of shares vested during the year	64,779	136,945	246,047

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

A summary of PSARs and PRS shares is as follows:

	PSARs			PRS		
	Number of Share Units	Weighted Average		Number of Share Units	Weighted Average	
		Price	Remaining Contract Terms		Price	Remaining Contract Terms
	(In Thousands)		(In Years)	(In Thousands)		(In Years)
Outstanding as of						
December 31, 2021	4,510	\$ 130.23	4.1	1,070	\$ 122.41	2.5
Granted	808	243.40		168	238.54	
Exercised	(1,616)	119.34		(288)	98.47	
Forfeited	(308)	155.09		(78)	137.13	
Outstanding as of						
December 31, 2022	3,394	160.09	4.0	872	151.41	2.4
Granted	2,762	145.77		1,002	145.67	
Exercised	(1,329)	130.59		(252)	116.36	
Forfeited	(788)	239.79		(37)	180.80	
Outstanding as of						
December 31, 2023	4,039	144.46	4.4	1,585	152.73	2.1
Exercisable as of						
December 31, 2023	28	\$ 139.51	3.9	9	\$ 149.59	2.1

The PSARs compensation was an expense of \$17 million for the year ended December 31, 2023 and an expense of \$(34) million for the year ended December 31, 2022 and an expense of \$253 million for the year ended December 31, 2021. The PSARs accrued compensation liability was \$13 million as of December 31, 2023 and \$99 million as of December 31, 2022. The unrecognized compensation expense related to nonvested PSARs awards was \$20 million for the year ended December 31, 2023, \$19 million for the year ended December 31, 2022 and \$108 million for the year ended December 31, 2021. The weighted average period over which the expense is expected to be recognized is 4.4 years. The PSARs unrecognized compensation expense represents the total intrinsic value of all shares issued if 100% vested at current stock price, minus current compensation liability.

The PRS compensation expense was \$96 million for the year ended December 31, 2023 and \$31 million for the year ended December 31, 2022 and \$77 million for the year ended December 31, 2021. The PRS accrued compensation liability was \$148 million for the year ended December 31, 2023 and \$99 million for the year ended December 31, 2022. The unrecognized compensation expense related to nonvested PRS awards was \$87 million as of December 31, 2023, \$56 million as of December 31, 2022 and \$77 million as of December 31, 2021 respectively. The weighted average period over which the expense is expected to be recognized is 2.1 years. The PRS unrecognized compensation expense represents the total value of all shares issued if 100% vested at the current stock price, minus current compensation liability.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

14. Surplus notes

The following table summarizes the surplus notes issued and outstanding as of December 31, 2023:

Issue Date	Face Amount	Carrying Value	Interest Rate	Maturity Date	Scheduled Interest Payment Dates
	(\$ In Millions)				
03/01/1994	50	50	7.500%	03/01/2024	Mar 1 & Sept 1
05/12/2003	193	193	5.625%	05/15/2033	May 15 & Nov 15
06/01/2009	130	129	8.875%	06/01/2039	Jun 1 & Dec 1
01/17/2012	263	263	5.375%	12/01/2041	Jun 1 & Dec 1
04/15/2015	258	254	4.500%	04/15/2065	Apr 15 & Oct 15
03/23/2017	475	471	4.900%	04/01/2077	Apr 1 & Oct 1
10/11/2019	838	597	3.729%	10/15/2070	Apr 15 & Oct 15
04/16/2020	700	697	3.375%	04/15/2050	Apr 15 & Oct 15
06/26/2020	600	820	5.077%	02/15/2069	Feb 15 & Aug 15
03/01/2021	200	232	5.077%	02/15/2069	Feb 15 & Aug 15
11/18/2021	675	670	3.200%	12/01/2061	Jun 1 & Dec 1
12/01/2022	500	500	5.672%	12/01/2052	Jun 1 & Dec 1
Total	\$ 4,882	\$ 4,876			

All payments of interest and principal are subject to the prior approval of the Division. Interest expense is not recorded until approval for payment is received from the Division. As of December 31, 2023, the unapproved interest was \$44 million. Through December 31, 2023, the Company paid cumulative interest of \$2,609 million on surplus notes. Interest of \$231 million was approved and paid during the year ended December 31, 2023.

The anticipated sinking fund payments that are due for the notes issued in 1994 are \$50 million in 2024. There are no sinking fund requirements for the notes issued in 2003, 2009, 2012, 2015, 2017, 2019, 2020, 2021 or 2022.

These notes are unsecured and subordinate to all present and future indebtedness of the Company, all policy claims and all prior claims against the Company as provided by the Massachusetts General Laws. The surplus notes are all held by bank custodians for unaffiliated investors. All issuances were approved by the Division. Surplus notes are included in surplus on the Statutory Statements of Financial Position.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

15. Presentation of the Statutory Statements of Cash Flows

The following table presents those transactions that have affected the Company's recognized assets or liabilities but have not resulted in cash receipts or payments during the years ended December 31, 2023, 2022 and 2021. Accordingly, the Company has excluded these non-cash activities from the Statutory Statements of Cash Flows for the years ended December 31, 2023, 2022 and 2021.

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Bond conversions and refinancing	\$ 1,460	\$ 1,177	\$ 729
Transfer of partnerships and limited liability companies to partnerships and limited liability companies	277	620	-
Change in market value of corporate owned life insurance asset	217	(46)	272
Stock conversions	202	13	107
Transfer of mortgage loans to bonds	132	-	-
Bonds transferred to partnerships and limited liability companies	122	441	-
Transfer of partnerships and limited liability companies to bonds	100	187	-
Transfer of mortgage loans to short-term investments	60	-	-
Transfer of stocks to partnerships and limited liability companies	38	-	-
Net investment income payment in-kind bonds	14	12	16
Accrued discount on mortgage loans	10	-	-
Transfer of partnerships and limited liability companies to stocks	3	-	-
Transfer of bonds to mortgage loans	-	626	-
Transfer of partnerships and limited liability companies to common stocks - subsidiaries and affiliates	-	227	-
Transfer of common stocks unaffiliated to common stocks - subsidiaries and affiliates	-	97	-
Transfer of mortgage loans to partnerships and limited liability companies	-	40	11
Deferred gain on real estate	-	16	-
Premium income recognized for group annuity contracts	-	-	1,237
Bonds received as consideration for group annuity contracts	-	-	(1,231)
Premium ceded in exchange for invested assets	-	-	(514)
Bonds transferred in exchange for premium	-	-	511
Surplus notes issued in exchange for bonds	-	-	233
Bonds received as consideration for surplus notes	-	-	(233)
Transfer of bonds to cash equivalent	-	-	150
Exchange of mortgage loans for other assets	-	-	18
Transfer of stocks to partnerships	-	-	4
Preferred stock transferred in exchange for premium ceded	-	-	3
Common stock received as consideration for group annuity contracts	-	-	(6)

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

16. Business risks, commitments and contingencies

a. Risks and uncertainties

The Company operates in a business environment subject to various risks and uncertainties. The principal risks include insurance and underwriting risks, investment and interest rate risks, currency exchange risk and credit risk. The combined impact of these risks could have a material, adverse effect on the Company's financial statements or result in operating losses in future periods. The Company employs the use of reinsurance, portfolio diversification, asset/liability management processes and other risk management techniques to mitigate the impact of these risks.

Insurance and underwriting risks

The Company prices its products based on estimated benefit payments reflecting assumptions with respect to mortality, morbidity, longevity, persistency, interest rates and other factors. If actual policy experience emerges that is significantly and adversely different from assumptions used in product pricing, the effect could be material to the profitability of the Company. For participating whole life products, the Company's dividends to policyholders primarily reflect the difference between actual investment, mortality, expense and persistency experience and the experience embedded in the whole life premiums and guaranteed elements. The Company also reinsures certain life insurance and other long-term care insurance policies to mitigate the impact of its underwriting risk.

Investment and interest rate risks

The fair value, cash flows and earnings of investments can be influenced by a variety of factors including changes in interest rates, credit spreads, equity markets, portfolio asset allocation and general economic conditions. The Company employs a rigorous asset/liability management process to help mitigate the economic impacts of various investment risks, in particular interest rate risk. By effectively matching the market sensitivity of assets with the liabilities they support, the impact of interest rate changes is addressed, on an economic basis, as the change in the value of the asset is offset by a corresponding change in the value of the supported liability. The Company uses derivatives, such as interest rate swaps and swaptions, as well as synthetic assets to reduce interest rate and duration imbalances determined in asset/liability analyses.

The levels of U.S. interest rates are influenced by U.S. monetary policies and by the relative attractiveness of U.S. markets to investors versus other global markets. As interest rates increase, certain debt securities may experience amortization or prepayment speeds that are slower than those assumed at purchase, impacting the expected maturity of these securities and the ability to reinvest the proceeds at the higher yields. Rising interest rates may also result in a decrease in the fair value of the investment portfolio. As interest rates decline, certain debt securities may experience accelerated amortization and prepayment speeds than what was assumed at purchase. During such periods, the Company is at risk of lower net investment income as it may not be able to reinvest the proceeds at comparable yields. Declining interest rates may also increase the fair value of the investment portfolio.

Interest rates also have an impact on the Company's products with guaranteed minimum payouts and on interest credited to account holders. As interest rates decrease, investment spreads may contract as crediting rates approach minimum guarantees, resulting in an increased liability.

In periods of increasing interest rates, policy loans, surrenders and withdrawals may increase as policyholders seek investments with higher perceived returns. This could result in cash outflows requiring the Company to sell invested assets at a time when the prices of those assets are adversely affected by the increase in market interest rates, which could cause the Company to realize investment losses.

Currency exchange risk

The Company has currency risk due to its non-U.S. dollar denominated investments and medium-term notes along with its indirect international operations. The Company mitigates a portion of its currency risk through the use of cross-currency swaps and forward contracts. Cross-currency swaps are used to minimize currency risk for certain non-U.S. dollar assets and liabilities through a pre-specified exchange of interest and principal. Forward contracts are used to hedge movements in exchange rates.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Credit and other market risks

The Company manages its investments to limit credit and other market risks by diversifying its portfolio among various security types and industry sectors as well as purchasing credit default swaps to transfer some of the risk.

Stressed conditions, volatility and disruptions in global capital markets or in particular markets or financial asset classes can have an adverse effect on the Company, in part because the Company has a large investment portfolio and assets supporting the Company's insurance liabilities are sensitive to changing market factors. Global market factors, including interest rates, credit spread, equity prices, real estate markets, foreign currency exchange rates, consumer spending, business investment, government spending, the volatility and strength of the capital markets, deflation and inflation, all affect the business and economic environment and, ultimately, the profitability of the Company's business. Disruptions in one market or asset class can also spread to other markets or asset classes. Upheavals in the financial markets can also affect the Company's business through their effects on general levels of economic activity, employment and customer behavior.

Real estate markets are monitored continuously with attention on regional differences in price performance, absorption trends and supply and demand fundamentals that can impact the rate of foreclosures and delinquencies. Public sector strengths and weaknesses, job growth and macro-economic issues are factors that are closely monitored to identify any impact on the Company's real estate related investments.

The CMBS, RMBS and leveraged loan sectors are sensitive to evolving conditions that can impair the cash flows realized by investors and is subject to uncertainty. Management's judgment regarding OTTI and estimated fair value depends upon the evolving investment sector and economic conditions. It can also be affected by the market liquidity, a lack of which can make it difficult to obtain accurate market prices for RMBS and other investments, including CMBS and leveraged loans. Any deterioration in economic fundamentals, especially related to the housing sector could affect management's judgment regarding OTTI.

The Company has investments in structured products exposed primarily to the credit risk of corporate bank loans, corporate bonds or credit default swap contracts referencing corporate credit risk. Most of these structured investments are backed by corporate loans and are commonly known as collateralized loan obligations that are classified as CDO. The portfolios backing these investments are actively managed and diversified by industry and individual issuer concentrations. Due to the complex nature of CDO and the reduced level of transparency to the underlying collateral pools for many market participants, the recovery in CDO valuations generally lags the overall recovery in the underlying assets. Management believes its scenario analysis approach, based primarily on actual collateral data and forward looking assumptions, does capture the credit and most other risks in each pool. However, in a rapidly changing economic environment, the credit and other risks in each collateral pool will be more volatile and actual credit performance of CDO may differ from the Company's assumptions.

The Company continuously monitors its investments and assesses their liquidity and financial viability; however, the existence of the factors described above, as well as other market factors, could negatively impact the market value of the Company's investments. If the Company sells its investments prior to maturity or market recovery, these investments may yield a return that is less than the Company otherwise would have been able to realize.

Asset-based fees calculated as a percentage of the separate account assets are a source of revenue to the Company. Gains and losses in the investment markets may result in corresponding increases and decreases in the Company's separate account assets and related revenue.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Market risk arises within the Company's employee benefit plans to the extent that the obligations of the plans are not fully matched by assets with determinable cash flows. Pension and postretirement obligations are subject to change due to fluctuations in the discount rates used to measure the liabilities as well as factors such as changes in inflation, salary increases and participants living longer. The risks are that such fluctuations could result in assets that are insufficient over time to cover the level of projected benefit obligations. In addition, increases in inflation and members living longer could increase the pension and postretirement obligations. Management determines the level of this risk using reports prepared by independent actuaries and takes action, where appropriate, in terms of setting investment strategy and determining contribution levels. In the event that the pension obligations arising under the Company's employee benefit plans exceed the assets set aside to meet the obligations, the Company may be required to make additional contributions or increase its level of contributions to these plans.

The long-term impact of the COVID-19 pandemic is dependent on numerous factors including, but not limited to, the length and severity of the pandemic, the efficacy and rate of vaccine adoption and therapeutics, the responses to the pandemic taken by governments and private sector businesses, and the impacts on MassMutual's policyholders, employees and counterparties. At its height, the pandemic led to significant economic disruption, including significant volatility in the U.S. and international markets, which had an adverse effect on MassMutual's business. The extent to which the COVID-19 pandemic continues to impact MassMutual's business will depend on future developments which are highly uncertain, including the emergence of future variants of COVID-19 and the efficacy of vaccines in the broader population (including with respect to future variants).

Political Uncertainties

Political events, domestically or internationally, may directly or indirectly trigger or exacerbate risks related to product offerings, profitability, or any of the risk factors described above. Whether those underlying risk factors are driven by geopolitics or not, the Company's dynamic approach to managing risks enables management to identify risks, internally and externally, develop mitigation plans, and respond to risks in an attempt to proactively reduce the potential impact of each underlying risk factor on the Company.

b. Leases

The Company leases office space and equipment in the normal course of business under various noncancelable operating lease agreements. Additionally, the Company, as lessee, has entered various sublease agreements with affiliates for office space, such as Barings. Total rental expense on net operating leases, recorded in general insurance expenses, was \$93 million for the year ended December 31, 2023 and \$91 million for the year ended December 31, 2022. Net operating leases are net of sublease receipts of \$5 million for the year ended December 31, 2023 and \$3 million for the year ended December 31, 2022.

For the years ended December 31, 2023 and December 31, 2022, the company has not entered into any sale-leaseback transactions with any unrelated parties.

Future minimum commitments for all lease obligations as of December 31, 2023 were as follows:

	Gross	Affiliated Subleases	Nonaffiliated Subleases	Net
	(In Millions)			
2024	\$ 85	\$ 2	\$ 4	\$ 79
2025	73	2	4	67
2026	58	2	4	52
2027	52	2	2	48
2028	48	1	2	45
Thereafter	304	-	7	297
Total	\$ 620	\$ 9	\$ 23	\$ 588

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

c. *Guaranty funds*

The Company is subject to state insurance guaranty fund laws. These laws assess insurance companies' amounts to be used to pay benefits to policyholders and policy claimants of insolvent insurance companies. Many states allow these assessments to be credited against future premium taxes. The Company believes such assessments in excess of amounts accrued will not materially impact its financial position, results of operations or liquidity.

b. *Litigation and regulatory matters*

In the normal course of business, the Company is involved in disputes, litigation and governmental or regulatory inquiries, administrative proceedings, examinations and investigations, both pending and threatened. These matters, if resolved adversely against the Company or settled, may result in monetary damages, fines and penalties or require changes in the Company's business practices. The resolution or settlement of these matters is inherently difficult to predict. Based upon the Company's assessment of these pending matters, the Company does not believe that the amount of any judgment, settlement or other action arising from any pending matter is likely to have a material adverse effect on the statement of financial position. However, an adverse outcome in certain matters could have a material adverse effect on the results of operations for the period in which such matter is resolved, or an accrual is determined to be required, on the financial statement financial position, or on our reputation.

The Company evaluates the need for accruals of loss contingencies for each matter. When a liability for a matter is probable and can be estimated, the Company accrues an estimate of the loss offset by related insurance recoveries or other contributions, if any. An accrual may be subject to subsequent adjustment as a result of additional information and other developments. The resolution of matters is inherently difficult to predict, especially in the early stages of matter. Even if a loss is probable, due to many complex factors, such as speed of discovery and the timing of court decisions or rulings, a loss or range of loss may not be reasonably estimated until the later stages of the matter. For matters where a loss is material and it is either probable or reasonably possible then it is disclosed. For matters where a loss may be reasonably possible, but not probable, or is probable but not reasonably estimated, no accrual is established, but the matter, if material, is disclosed.

e. *Commitments*

In the normal course of business, the Company provides specified guarantees and funding to MMHLLC and certain of its subsidiaries. As of December 31, 2023, the Company had approximately \$800 million of these unsecured funding commitments to its subsidiaries and \$261 million as of December 31, 2022. The unsecured commitments are included in private placements in the table below. As of December 31, 2023 and 2022, the Company had not funded, nor had an outstanding balance due on, these commitments.

In the normal course of business, the Company enters into letter of credit arrangements. The Company had outstanding letter of credit arrangements of approximately \$77 million as of December 31, 2023 and approximately \$77 million as of December 31, 2022. As of December 31, 2023 and 2022, the Company did not have any funding requests attributable to these letter of credit arrangements.

In the normal course of business, the Company enters into commitments to purchase certain investments. The majority of these commitments have funding periods that extend between one and five years. The Company is not required to fund commitments once the commitment period expires.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

As of December 31, 2023, the Company had the following outstanding commitments:

	2024	2025	2026	2027	2028	Thereafter	Total
	(In Millions)						
Private placements	\$ 3,803	\$ 1,770	\$ 2,620	\$ 1,236	\$ 373	\$ 727	\$ 10,529
Mortgage loans	402	361	588	63	80	77	1,571
Partnerships and LLC	1,703	1,055	951	961	336	1,226	6,232
LIHTCs (including equity contributions)	-	-	-	-	1	42	43
Total	\$ 5,908	\$ 3,186	\$ 4,159	\$ 2,260	\$ 790	\$ 2,072	\$ 18,375

In the normal course of business the Company enters into commitments related to property lease arrangements, certain indemnities, investments and other business obligations. As of December 31, 2023 and 2022, the Company had no outstanding obligations attributable to these commitments.

f. Guarantees

In the normal course of business the Company enters into guarantees related to employee and retirement benefits, the maintenance of subsidiary regulatory capital, surplus levels and liquidity sufficient to meet certain obligations, and other property lease arrangements. If the Company were to recognize a liability, the financial statement impact would be to recognize either an expense or an investment in a subsidiary, controlled, or affiliated entity. The Company has no expectations for recoveries from third parties should these guarantees be triggered. As of December 31, 2023 and 2022, the Company had no outstanding obligations to any obligor attributable to these guarantees.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following details contingent guarantees that are made on behalf of the Company's subsidiaries and affiliates as of December 31, 2023.

Type of guarantee	Nature of guarantee (including term) and events and circumstances that would require the guarantor to perform under guarantee	Carrying amount of liability	Maximum potential amount of future payments (undiscounted) required under the guarantee
Employee and Retirement Benefits	The Company guarantees the payment of certain employee and retirement benefits for its wholly-owned subsidiary Barings, if the subsidiary is unable to pay.	-	The liabilities for these plans of \$564 million have been recorded on the subsidiaries' books and represent the Company's maximum obligation.
Capital and Surplus Support of Subsidiaries	Certain guarantees of the Company provide for the maintenance of a subsidiary's regulatory capital, surplus levels and liquidity sufficient to meet certain obligations. These unlimited guarantees are made on behalf of certain wholly-owned subsidiaries. (C.M. Life and MML Bay State Life).	-	These guarantees are not limited and cannot be estimated.
Other Property Lease Arrangements	The Company guarantees the payment of various lease obligations on behalf of its subsidiaries and affiliates.	-	The future maximum potential obligations are immaterial to the Company.
Real Estate Development Guarantee	The construction lender for an office building in London, UK required a cost overrun guarantee equivalent to 8% of the total budgeted cost (£6 million). The Company will only be responsible for its pro rata share of any cost overruns with a maximum additional commitment of approximately £3 million.	-	£9 million
Secure Capital for Variable Annuity Separate Accounts	The Company guarantees the capital contributions required to be made by a variable annuity separate account contract holder in the event the contract holder fails to payoff a subscription line utilized to deploy capital for the separate account.	-	\$135 million with the right to increase the line to \$175 million.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

17. Related party transactions

MassMutual has management and service contracts and cost-sharing arrangements with various subsidiaries and affiliates where MassMutual, for a fee, will furnish a subsidiary or affiliate, as required, operating facilities, human resources, computer software development and managerial services.

MassMutual has agreements with its subsidiaries and affiliates, including Insurance Road LLC, Copper Hill LLC, MML Investment Advisers LLC, The MassMutual Trust Company, FSB, MassMutual International LLC and Baring International Investment Limited, where MassMutual receives revenue for certain recordkeeping and other services that MassMutual provides to customers who select, as investment options, mutual funds managed by these affiliates.

MassMutual has agreements with its subsidiaries, Barings, MML Investment Advisers LLC and MassMutual Intellectual Property LLC, which provide investment advisory services and licensing agreements to MassMutual.

The following table summarizes the transactions between the Company and the related parties:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Fee income:			
Management and service contracts and cost-sharing arrangements	\$ 425	\$ 366	\$ 364
Investment advisory income	16	18	23
Recordkeeping and other services	11	16	20
Fee expense:			
Investment advisory services	221	236	240
Royalty and licensing fees	84	71	58

The Company reported amounts due from subsidiaries and affiliates of \$132 million as of December 31, 2023 and \$103 million as of December 31, 2022. The Company reported amounts due to subsidiaries and affiliates of \$39 million as of December 31, 2023 and \$33 million as of December 31, 2022. Terms generally require settlement of these amounts within 30 to 90 days.

The Company held debt issued by MMHLLC that amounted to \$2,144 million as of December 31, 2023 and \$2,315 million as of December 31, 2022. The Company recorded interest income on MMHLLC debt of \$125 million in 2023 and \$94 million in 2022. The notes maturing as of June 2022 were refinanced at 5.00% for \$257 million. The notes maturing as of December 15, 2023 were refinanced at 5.75% for \$380 million. A new note was issued on December 22, 2023 with a maturity date of December 22, 2030 at 5.90% for \$375 million.

As of December 31, 2023, MMIH and C.M. Life, together, provided financing of \$5,500 million, \$5,253 million and \$247 million respectively, for MMAF that can be used to finance ongoing asset purchases. MMIH provided financing of \$5,253 million as of December 31, 2023 and \$5,253 million as of December 31, 2022. During 2022, MMAF borrowed \$2,244 million and repaid \$1,123 million under the credit facility. During 2023, MMAF borrowed \$2,271 million and repaid \$2,203 million under the credit facility. Outstanding borrowings under the facility were \$4,824 million as of December 31, 2023 and \$3,703 million as of December 31, 2022. Interest for these borrowings was \$131 million for the year ended December 31, 2023 and \$86 million for the year ended December 31, 2022. The floating rate borrowings bear interest at a spread over the 30 day LIBOR. The fixed rate borrowings bear an interest at a spread over average life Treasuries.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Together, MassMutual and C.M. Life, provide a credit facility to Jefferies Finance, LLC whereby Jefferies Finance, LLC (Jefferies) borrows cash through short-term approved financings to fund the purchase of loans for securitization. During 2023, Jefferies borrowed \$79 million and repaid \$79 million under the credit facility. During 2022, Jefferies borrowed \$225 million and repaid \$225 million under the credit facility. As of December 31, 2023, there were no outstanding borrowings under this facility. All outstanding interest due under the facility, as of December 31, 2023, had been paid. The interest of this facility is calculated based on a full pass through of interest accrued on the underlying loans purchased.

In 2023, MassMutual made capital contributions of \$13 million to HavenTech Asia.

In 2023, MassMutual made capital contributions of \$116 million to ITPS Holdings LLC.

In 2023, MassMutual made capital contributions of \$88 million to MassMutual Mortgage Lending LLC, \$50 million to MMIH Bond Holdings LLC, and \$13 million to MML CM LLC.

In 2023, MassMutual purchased \$531 million of private placement corporate assets from C.M. Life.

In 2022, Insurance Road LLC paid \$90 million in dividends and a \$123 million return of capital to MassMutual.

In 2022, MassMutual made capital contributions of \$17 million to MassMutual International LLC.

In 2022, MassMutual made capital contributions of \$35 million to ITPS Holding LLC.

In 2022, MassMutual transferred its ownership in Martello Re to MMHLLC of (\$58) million.

In 2022, MassMutual transferred its ownership of partnerships and LLCs to MMHLLC of \$194 million.

In 2022, MassMutual made contributions to DPI Acres Capital for \$154 million.

In 2022, MassMutual made contributions of \$27 million to downstream subsidiaries.

The Company has reinsurance agreements with its subsidiary, C.M. Life, and its indirect subsidiary, MML Bay State, including stop-loss, Modco and yearly renewable term agreements on life insurance and annuity products. The Company also has coinsurance agreements with C.M. Life where the Company assumes substantially all of the premium on certain universal life policies.

Effective December 31, 2020, MassMutual provides C.M. Life a stop-loss coverage to transfer a specific interest rate risk. All Odyssey fixed-deferred annuity contracts issued by C.M. Life are covered under this agreement. C.M. Life pays an annual premium to MassMutual. If the coverage is triggered, there will be a settlement at year end from MassMutual to C.M. Life. The maximum total liability of MassMutual under the agreement is \$200 million over seven years.

As of December 31, 2023, the net reinsurance amounts due to C.M. Life and MML Bay State were \$29 million and as of December 31, 2022, the net reinsurance amounts due to C.M. Life and MML Bay State were \$53 million. These outstanding balances are due and payable with terms ranging from monthly to annually, depending on the agreement in effect.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following table summarizes the reinsurance transactions for these reinsurance agreements:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Premium assumed	\$ 43	\$ 44	\$ 49
Modco adjustments, included in fees and other income	24	12	11
Expense allowance on reinsurance assumed, included in commissions	(13)	(13)	(13)
Policyholders' benefits	(108)	(88)	(144)
Experience refunds (paid) received	1	(1)	-
Accrual for stop-loss agreement	-	(18)	-

The Company currently has one longevity swap reinsurance agreement with Rothesay Life Plc on certain inforce annuity products. Under this agreement, the Company is the reinsurer and Rothesay Life Plc is the cedent.

The following table summarizes the related party transactions between the Company and Rothesay Life Plc:

	Years Ended December 31,		
	2023	2022	2021
	(In Millions)		
Premium assumed	\$ (248)	\$ (203)	\$ (165)
Policyholders' benefits	235	192	157

For further information on common stocks - subsidiaries and affiliates, refer to *Note 5c. "Common stocks - subsidiaries and affiliates."*

In the normal course of business, the Company provides specified guarantees and funding to MMHLLC and certain of its subsidiaries. Refer to *Note 16e. "Commitments"* for information on the Company's accounting policies regarding these related party commitments and *Note 16f. "Guarantees"* for information on the guarantees.

18. *Subsidiaries and affiliated companies*

A summary of ownership and relationship of the Company and its subsidiaries and affiliated companies as of December 31, 2023 is illustrated below. Subsidiaries are wholly owned, except as noted.

Subsidiaries of MassMutual

C.M. Life
Berkshire Way LLC
MML Special Situations Investor LLC
Timberland Forest Holding LLC – 37% (remaining 63% owned by MassMutual Trad Private Equity LLC)
MSP – SC, LLC
Insurance Road LLC
MM Copper Hill Road LLC
Jefferies Finance LLC– 50% (remaining 50% owned by Jefferies Group, Inc.)
MML Distributors LLC – 99% (remaining 1% owned by MassMutual Holding LLC)
MML Investment Advisers, LLC
Pioneers Gate LLC
MML Strategic Distributors, LLC
The MassMutual Trust Company, FSB

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

MassMutual Mortgage Lending LLC
MML Private Placement Investment Company I, LLC
MML Private Equity Fund Investor LLC
MM Private Equity Intercontinental LLC
MassMutual Holding LLC
MassMutual Investment Holding, LLC
MassMutual International, LLC
MML Mezzanine Investor II, LLC
MML Mezzanine Investor III, LLC
MassMutual External Benefits Group LLC
EM Opportunities LLC
MassMutual MCAM Insurance Company, Inc.
CML Global Capabilities
MM Global Capabilities I LLC
MM Global Capabilities II LLC
MM Global Capabilities III LLC
MML CM LLC
Glidepath Holdings Inc
ITPS Holding LLC
MM/Barings Mutifamily TEBS 2020 LLC
MM Direct Private Investments Holding LLC
MassMutual Ventures Europe/APAC I GP, LLC
MassMutual Ventures US IV, GP, LLC
DPI-ACRES Capital LLC
Amherst Long Term Holdings, LLC

Subsidiaries of C.M. Life Insurance Company

MML Bay State Life Insurance Company
CML Mezzanine Investor III, LLC
CML Special Situations Investor LLC

Subsidiaries of MML Bay State Life Insurance Company

(No subsidiaries)

Subsidiaries of Timberland Forest Holding LLC

Lyne Adirondack Forest Company, LLC

Subsidiaries of Insurance Road LLC

MassMutual Trad Private Equity LLC
MassMutual Intellectual Property LLC
Trad Investments LLC

MML Investment Advisers, LLC

(No Subsidiaries)

Pioneers Gate LLC

(No subsidiaries)

Subsidiaries of MassMutual Holding LLC

Fern Street LLC
Low Carbon Energy Holding
Haven Life Insurance Agency, LLC
MassMutual Assignment Company
MassMutual Capital Partners LLC
MassMutual Ventures Holding LLC

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

MM Rothesay Holdco US LLC
MML Investors Services, LLC
LifeScore Labs, LLC
Sleeper Street LLC
MM Asset Management Holding LLC
MM Catalyst Fund LLC
Aland Royalty Holdings LP
GASL Holdings LLC
Barings Asset-Based Income Fund (US) LP
Babson Capital Global Special Situation Credit Fund 2
Barings Global Real Assets Fund LP
Barings Global Special Situations Credit Fund 3
Barings North American Private Loan Fund LP
Marco Hotel LLC
HB Naples Golf Owner LLC
RB Apartments LLC

Subsidiaries of MassMutual International LLC

MassMutual Solutions LLC
Yunfeng Financial Group Limited
MassMutual Asia Limited (SPV)

Subsidiaries of CML CM LLC

Blueprint Income LLC
Flourish Digital Assets LLC
Flourish Financial LLC
Flourish Holding Company LLC
Flourish Technologies LLC

Subsidiaries of Glidepath Holdings Inc

Great American Life Insurance Company
AAG Insurance Agency, LLC
Annuity Investor Life Insurance Company
Great American Advisors, LLC
Manhattan National Holding Corporation

Subsidiaries of MassMutual Ventures Holding LLC

MassMutual Ventures US I LLC
MassMutual Ventures US II LLC
MassMutual Ventures US III LLC
MassMutual Ventures US IV LLC
MassMutual Ventures UK LLC
MassMutual Ventures Southeast Asia I LLC
MassMutual Ventures Southeast Asia II LLC
MassMutual Ventures Management LLC
MassMutual Ventures SEA Management Private Limited (an indirect subsidiary of Subsidiary of MassMutual Ventures Holding LLC)
Athens Fund Management LLC
Open Alternatives LLC

MML Investors Services, LLC

MMLISI Financial Alliances, LLC
MML Insurance agency, LLC

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Subsidiaries of Barings LLC (a subsidiary of MM Asset Management Holding LLC)

Barings Finance LLC
Barings Securities LLC
Barings Guernsey Limited
Barings Real Estate Acquisitions LLC
Barings Asset Management (Asia) Holdings Limited
Barings Multifamily Capital Holdings LLC
Barings Australia Real Estate Holdings Pty Ltd

Subsidiaries of Baring Asset Management Limited (an indirect subsidiary of MassMutual Baring Holding LLC)

Baring International Investment Limited
Baring International Investment Management Holdings Limited
Baring Fund Managers Limited
Baring Investment Services Limited
Barings Global Advisers Limited
Barings European Core Property Fund GP Sàrl
Barings BME GP Sàrl
Barings Core Fund Feeder I GP S.à.r.l.
Barings Investment Fund (LUX) GP S.à.r.l.
Barings GPC GP S.à.r.l.
Barings Umbrella Fund (LUX) GP S.à.r.l.
GPLF4(S) GP S.à.r.l.
PREIF Holdings Limited Partnership

Subsidiaries of Baring International Investment Limited

(No subsidiaries)

Subsidiaries of MassMutual Investment Holding

MML Management Corporation
MassMutual Asset Finance LLC
MMIH Bond Holdings LLC

Subsidiaries of MML Management Corporation

MassMutual Holding MSC, Inc.
MassMutual International Holding MSC, Inc.

Subsidiaries of MassMutual Asset Finance LLC

MMAF Equipment Finance LLC 2014-A
MMAF Equipment Finance LLC 2017-A
MMAF Equipment Finance LLC 2017-B
MMAF Equipment Finance LLC 2018-A
MMAF Equipment Finance LLC 2019-A
MMAF Equipment Finance LLC 2019-B
MMAF Equipment Finance LLC 2020-A
MMAF Equipment Finance LLC 2020-B
MMAF Equipment Finance LLC 2021-A
MMAF Equipment Finance LLC 2022-A
MMAF Equipment Finance LLC 2022-B
Rozier LLC

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

Information regarding filings of Subsidiaries and Controlled Affiliates

The following presents certain information regarding the Company's valuation filings for controlled affiliates of the Company:

	CUSIP	As of December 31, 2023				2022 Approved Valuation	Filing Code	Valuation Method Disallowed?
		Gross Value	Non- admitted	Admitted	Latest Filing			
		(\$ in Millions)						
MassMutual Holding LLC	57543#-11-8	\$ 17,592	\$ -	\$ 17,592	8/30/2023	\$ 17,227	Sub-2	No
The MassMutual Trust Co, FSB	57631@-10-5	25	-	25	6/30/2023	25	Sub-2	No
MM Investment Holding	G5695@10-8	687	-	687	7/12/2023	659	Sub-2	No
MM Investment Holding	G5695@11-6	1,162	-	1,162	7/12/2023	1,071	Sub-2	No
Glidepath Holdings Inc	37930@-10-5	3,643	-	3,643	11/11/2022	3,475	Sub-2	No
Aggregate Total		<u>\$ 23,109</u>	<u>\$ -</u>	<u>\$ 23,109</u>		<u>\$ 22,457</u>		

19. Subsequent events

Management of the Company has evaluated subsequent events through February 27, 2024, the date the financial statements were available to be issued to state regulators and subsequently on the Company's website. No events have occurred subsequent to the date of the financial statements, except for:

On January 17, 2024, MassMutual issued a \$650 million funding agreement with a 4.85% fixed rate and a 5-year maturity.

On January 29, 2024, MassMutual issued a \$300 million funding agreement with a floating rate based on the Secured Overnight Financing Rate and a 3-year maturity.

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

20. Impairment listing for loan-backed and structured securities

The following are the total cumulative adjustments and impairments for loan-backed and structured securities since July 1, 2009:

Period Ended	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
December 31, 2023	\$ 53,672,524	\$ -	\$ 53,672,524	\$ 51,118,891	\$ (2,553,633)	\$ 51,118,891	\$ 42,903,097
September 30, 2023	24,928,010	-	24,928,010	24,065,666	(862,344)	24,065,666	21,743,474
June 30, 2023	16,432,523	-	16,432,523	15,955,963	(476,560)	15,955,963	15,431,923
March 31, 2023	56,797,193	-	56,797,193	45,999,577	(10,797,616)	45,999,577	39,477,567
December 31, 2022	47,152,655	-	47,152,655	42,630,344	(4,522,311)	42,630,344	35,962,545
September 30, 2022	23,315,048	-	23,315,048	22,016,070	(1,298,978)	22,016,070	19,284,696
June 30, 2022	17,306,639	-	17,306,639	15,826,391	(1,480,248)	15,826,391	13,534,918
March 31, 2022	30,135,997	-	30,135,997	23,857,778	(6,278,218)	23,857,778	23,674,371
December 31, 2021	6,658,614	-	6,658,615	6,490,508	(168,107)	6,490,508	6,369,198
September 30, 2021	4,061,382	-	4,061,382	3,955,723	(105,659)	3,955,723	3,595,213
June 30, 2021	11,352,643	-	11,352,642	10,386,581	(966,063)	10,386,581	11,323,900
March 31, 2021	11,247,256	-	11,247,257	5,074,493	(6,172,764)	5,074,493	5,237,174
December 31, 2020	16,071,907	-	16,071,907	14,674,300	(1,397,607)	14,674,300	15,473,517
September 30, 2020	21,375,383	-	21,375,383	19,160,250	(2,215,134)	19,160,250	18,862,027
June 30, 2020	10,180,123	-	10,180,123	8,992,610	(1,187,513)	8,992,610	9,249,851
March 31, 2020	24,799,788	-	24,799,788	20,197,344	(4,602,443)	20,197,344	24,683,947
December 31, 2019	3,992,400	-	3,992,400	3,539,281	(453,119)	3,539,281	3,439,138
September 30, 2019	16,909,029	-	16,909,029	15,191,932	(1,717,097)	15,191,932	14,639,756
June 30, 2019	6,980,030	-	6,980,030	6,187,029	(793,001)	6,187,029	7,133,620
March 31, 2019	7,791,000	-	7,791,000	7,634,637	(156,363)	7,634,637	7,683,021
December 31, 2018	4,550,173	-	4,550,173	3,815,559	(734,614)	3,815,559	4,014,514
September 30, 2018	4,320,826	-	4,320,826	3,663,181	(657,645)	3,663,181	3,687,297
June 30, 2018	634,235	-	634,235	279,221	(355,014)	279,221	386,752
March 31, 2018	645,690	-	645,690	488,181	(157,509)	488,181	448,494
December 31, 2017	3,949,513	-	3,949,513	1,958,759	(1,990,754)	1,958,759	2,023,952
September 30, 2017	4,436,542	-	4,436,542	876,942	(3,559,600)	876,942	4,647,683
June 30, 2017	40,538,551	-	40,538,551	39,808,956	(729,595)	39,808,956	60,990,732
March 31, 2017	41,788,380	-	41,788,380	41,391,889	(396,491)	41,391,889	56,156,936
December 31, 2016	42,175,938	-	42,175,938	42,045,721	(130,217)	42,045,721	54,619,477
September 30, 2016	44,266,478	-	44,266,478	41,890,535	(2,375,942)	41,890,535	61,300,066
June 30, 2016	49,097,217	-	49,097,217	48,202,703	(894,514)	48,202,703	63,207,410
March 31, 2016	57,985,071	-	57,985,071	55,783,979	(2,201,092)	55,783,979	70,578,397
December 31, 2015	4,881,394	-	4,881,394	4,783,194	(98,200)	4,783,194	4,728,736
September 30, 2015	50,531,382	-	50,531,382	45,665,859	(4,865,524)	45,665,859	58,523,652
June 30, 2015	66,924,927	-	66,924,927	65,240,585	(1,684,341)	65,240,585	72,953,475
March 31, 2015	17,856,447	-	17,856,447	17,681,510	(174,937)	17,681,510	17,553,999
December 31, 2014	69,225,743	-	69,225,743	68,301,291	(924,452)	68,301,291	79,410,553
September 30, 2014	645,721	-	645,721	604,437	(41,284)	604,437	627,381
June 30, 2014	57,012,606	-	57,012,606	55,422,168	(1,590,438)	55,422,168	75,253,388
March 31, 2014	91,702,041	-	91,702,041	80,744,074	(10,957,967)	80,744,074	97,672,071
December 31, 2013	113,707,951	-	113,707,951	108,815,640	(4,892,311)	108,815,640	111,783,052
September 30, 2013	81,945,730	-	81,945,730	80,589,482	(1,356,248)	80,589,482	77,049,314
June 30, 2013	147,215,936	-	147,215,936	142,140,572	(5,075,365)	142,140,572	130,973,023
March 31, 2013	194,772,025	-	194,772,025	188,372,089	(6,399,936)	188,372,089	176,678,910
December 31, 2012	378,096,660	-	378,096,660	366,323,110	(11,773,550)	366,323,110	333,086,073
September 30, 2012	816,573,456	-	816,573,456	788,350,823	(28,222,633)	788,350,823	697,683,289
June 30, 2012	912,025,937	-	912,025,937	890,494,221	(21,531,716)	890,494,221	708,872,106
March 31, 2012	1,095,018,529	-	1,095,018,529	1,058,132,041	(36,886,488)	1,058,132,041	841,095,013
December 31, 2011	1,090,904,993	-	1,090,904,993	1,056,761,288	(34,143,705)	1,056,761,288	754,310,838
September 30, 2011	762,320,632	-	762,320,632	738,510,048	(23,810,584)	738,510,048	546,494,232

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

June 30, 2011	1,130,732,656	-	1,130,732,656	1,078,535,670	(52,196,986)	1,078,535,670	839,143,290
March 31, 2011	1,097,705,351	-	1,097,705,351	1,068,852,204	(28,853,147)	1,068,852,204	816,688,348
December 31, 2010	968,742,508	-	968,742,508	950,111,417	(18,631,091)	950,111,417	708,895,637
September 30, 2010	915,728,030	-	915,728,030	889,896,058	(25,831,972)	889,896,058	673,462,493
June 30, 2010	1,362,887,892	-	1,362,887,892	1,335,628,212	(27,259,681)	1,335,628,212	975,241,506
March 31, 2010	1,471,905,696	-	1,471,905,696	1,391,337,543	(80,568,153)	1,391,337,543	1,015,645,802
December 31, 2009	1,349,124,214	-	1,349,124,214	1,290,817,168	(58,307,047)	1,290,817,168	852,088,739
September 30, 2009	2,953,442,689	(106,853,708)	2,846,588,981	2,700,948,264	(145,640,717)	2,700,948,264	1,692,409,640
Totals		\$ (106,853,708)			\$ (694,106,238)		

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2023:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
040104RV5	\$ 2,347,899	\$ -	\$ 2,347,899	\$ 2,282,725	\$ (65,174)	\$ 2,282,725	\$ 1,302,564
040104TF8	54,340	-	54,340	52,649	(1,691)	52,649	32,844
040104TG6	691,003	-	691,003	659,349	(31,654)	659,349	425,196
04012XAC9	181,150	-	181,150	170,182	(10,968)	170,182	110,338
12479DAC2	1,630,508	-	1,630,508	1,585,965	(44,543)	1,585,965	1,297,291
1248MGAJ3	58,623	-	58,623	57,506	(1,117)	57,506	34,138
17311YAC7	1,187,982	-	1,187,982	1,153,900	(34,082)	1,153,900	1,128,264
30247DAD3	1,217,263	-	1,217,263	1,201,793	(15,470)	1,201,793	492,353
35729RAE6	3,593,051	-	3,593,051	3,420,695	(172,356)	3,420,695	3,107,574
40431KAE0	1,990,110	-	1,990,110	1,933,246	(56,864)	1,933,246	2,021,305
45071KDD3	564,498	-	564,498	527,624	(36,874)	527,624	361,094
46629NAC7	44,849	-	44,849	43,647	(1,202)	43,647	26,205
46630KAA4	125,971	-	125,971	124,577	(1,394)	124,577	143,209
61749BAB9	80,209	-	80,209	75,699	(4,510)	75,699	62,492
61750FAE0	545,703	-	545,703	520,383	(25,320)	520,383	363,586
617526AE8	486,709	-	486,709	455,151	(31,558)	455,151	187,873
86359DXD4	453,194	-	453,194	443,928	(9,266)	443,928	154,120
073882AC6	71,557	-	71,557	48,705	(22,852)	48,705	70,671
12668ABP9	129,890	-	129,890	116,635	(13,255)	116,635	133,533
22943HAD8	3,271,684	-	3,271,684	3,247,368	(24,316)	3,247,368	1,868,818
251513AQ0	40,724	-	40,724	38,804	(1,920)	38,804	36,075
45254TRX4	72,218	-	72,218	71,387	(831)	71,387	56,387
45254TSM7	548,532	-	548,532	528,758	(19,774)	528,758	461,568
45660LAU3	56,496	-	56,496	52,294	(4,202)	52,294	56,783
45660LYW3	859,170	-	859,170	822,796	(36,374)	822,796	663,220
466247XE8	664,779	-	664,779	659,135	(5,644)	659,135	476,466
59020UW43	62,573	-	62,573	53,844	(8,729)	53,844	62,448
61915RBZ8	278,208	-	278,208	277,681	(527)	277,681	147,160
761118FM5	1,510,955	-	1,510,955	1,466,742	(44,213)	1,466,742	1,474,675
761118RJ9	128,234	-	128,234	127,627	(607)	127,627	62,725
85554NAG5	74,686	-	74,686	64,953	(9,733)	64,953	71,686
86358HHX0	174,701	-	174,701	164,900	(9,801)	164,900	128,481
86359BLQ2	695,503	-	695,503	655,372	(40,131)	655,372	471,720
92978EAA2	143,827	-	143,827	140,068	(3,759)	140,068	69,546
41161PTP8	222,917	-	222,917	220,268	(2,649)	220,268	158,889
41161PWB5	610,727	-	610,727	606,127	(4,600)	606,127	558,552
45660N5H4	1,863,029	-	1,863,029	1,822,939	(40,090)	1,822,939	1,020,735
45660NT88	20,836	-	20,836	20,337	(499)	20,337	12,881
576433H33	1,161,358	-	1,161,358	989,170	(172,188)	989,170	735,308
61915RBB1	2,021,487	-	2,021,487	2,020,812	(675)	2,020,812	1,337,686
86360UAF3	1,108,924	-	1,108,924	1,088,747	(20,177)	1,088,747	706,779
05949CCB0	31,358	-	31,358	30,629	(729)	30,629	32,023

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

17309FAE8	54,306	-	54,306	54,227	(79)	54,227	72,467
362341VU0	1,364,188	-	1,364,188	1,354,304	(9,884)	1,354,304	1,273,386
36298XAA0	5,896,550	-	5,896,550	5,835,572	(60,978)	5,835,572	4,308,340
576433NH5	314,175	-	314,175	303,311	(10,864)	303,311	189,068
57645LAA2	10,260,489	-	10,260,489	9,150,641	(1,109,848)	9,150,641	11,015,616
86359DMC8	4,340,486	-	4,340,486	4,016,353	(324,133)	4,016,353	3,563,716
86359DME4	364,895	-	364,895	359,366	(5,529)	359,366	355,243
Totals	\$ 53,672,524	\$ -	\$ 53,672,524	\$ 51,118,891	\$ (2,553,633)	\$ 51,118,891	\$ 42,903,097

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2023:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
05535DCF9	\$ 1,782,860	\$ -	\$ 1,782,860	\$ 1,774,615	\$ (8,245)	\$ 1,774,615	\$ 1,615,108
1248MGJ3	42,122	-	42,122	40,755	(1,367)	40,755	34,109
17311YAC7	1,214,183	-	1,214,183	1,173,580	(40,603)	1,173,580	1,158,277
30247DAD3	544,986	-	544,986	530,143	(14,843)	530,143	485,430
40431KAE0	2,020,232	-	2,020,232	1,964,115	(56,117)	1,964,115	1,941,678
46629NAC7	33,121	-	33,121	32,454	(667)	32,454	26,826
46630KAA4	152,848	-	152,848	149,286	(3,562)	149,286	140,157
57643LMP8	664,369	-	664,369	615,398	(48,971)	615,398	616,435
590212AB2	33,970	-	33,970	29,921	(4,049)	29,921	33,420
86359DXD4	169,272	-	169,272	159,443	(9,829)	159,443	163,801
86363HAB8	33,650	-	33,650	32,774	(876)	32,774	29,320
93934XAB9	123,880	-	123,880	115,382	(8,498)	115,382	121,783
05535DAN4	674,819	-	674,819	518,140	(156,679)	518,140	538,849
12667FYS8	83,749	-	83,749	70,404	(13,345)	70,404	83,180
12667GKG7	44,892	-	44,892	43,316	(1,576)	43,316	45,430
22943HAD8	3,333,227	-	3,333,227	3,209,290	(123,937)	3,209,290	1,862,665
32053LAA0	18,494	-	18,494	18,440	(54)	18,440	17,268
43739EAP2	1,209,064	-	1,209,064	1,182,999	(26,065)	1,182,999	1,133,684
45254TSM7	541,921	-	541,921	538,498	(3,423)	538,498	461,187
45660LYW3	775,781	-	775,781	720,142	(55,639)	720,142	694,930
466247XE8	565,725	-	565,725	560,689	(5,036)	560,689	492,033
61749LAN1	101,590	-	101,590	90,612	(10,978)	90,612	106,962
61915RBZ8	164,901	-	164,901	163,993	(908)	163,993	148,770
65535VRK6	471,315	-	471,315	442,770	(28,545)	442,770	467,415
761118RJ9	89,235	-	89,235	81,669	(7,566)	81,669	67,865
86358HHX0	168,641	-	168,641	166,229	(2,412)	166,229	118,809
86359A6A6	484,213	-	484,213	466,106	(18,107)	466,106	432,201
92978EAA2	80,092	-	80,092	77,179	(2,913)	77,179	72,870
126694YM4	579,079	-	579,079	572,556	(6,523)	572,556	496,668
41161PTP8	204,192	-	204,192	176,002	(28,190)	176,002	158,045
41161PWB5	670,938	-	670,938	662,621	(8,317)	662,621	557,761
61915RBB1	1,481,939	-	1,481,939	1,476,700	(5,239)	1,476,700	1,345,239
17309FAE8	73,197	-	73,197	54,698	(18,499)	54,698	75,336
362341VU0	1,378,634	-	1,378,634	1,378,467	(167)	1,378,467	1,232,954
36298XAA0	4,569,319	-	4,569,319	4,451,723	(117,596)	4,451,723	4,338,427
576433NH5	347,560	-	347,560	324,557	(23,003)	324,557	428,582
Totals	\$ 24,928,010	\$ -	\$ 24,928,010	\$ 24,065,666	\$ (862,344)	\$ 24,065,666	\$ 21,743,474

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2023:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
00442FAB8	\$ 50,571	\$ -	\$ 50,571	\$ 38,681	\$ (11,890)	\$ 38,681	\$ 8,265
040104RV5	1,421,615	-	1,421,615	1,379,721	(41,894)	1,379,721	1,316,932
1248MGJ3	42,545	-	42,545	42,165	(380)	42,165	34,889
17311YAC7	1,241,873	-	1,241,873	1,206,602	(35,271)	1,206,602	1,232,111
40431KAE0	2,053,478	-	2,053,478	2,006,843	(46,635)	2,006,843	2,030,117
45071KDD3	360,529	-	360,529	358,225	(2,304)	358,225	357,570
61750FAE0	396,971	-	396,971	394,270	(2,701)	394,270	358,577
84752CAE7	555,369	-	555,369	510,004	(45,365)	510,004	679,671
86359DXD4	182,513	-	182,513	169,184	(13,329)	169,184	170,546
92926SAB2	385	-	385	380	(5)	380	379
12667FYL3	212,185	-	212,185	199,941	(12,244)	199,941	201,624
12669FKR3	40,116	-	40,116	37,606	(2,510)	37,606	37,952
18974BAA7	131,289	-	131,289	130,311	(978)	130,311	133,783
18974BAN9	67,323	-	67,323	64,834	(2,489)	64,834	69,970
22540VG71	35,173	-	35,173	35,094	(79)	35,094	35,963
23321P6A1	1,405,020	-	1,405,020	1,371,044	(33,976)	1,371,044	1,329,368
32053LAA0	18,926	-	18,926	18,853	(73)	18,853	18,262
45660LAU3	69,258	-	69,258	65,015	(4,243)	65,015	67,725
466247XE8	578,949	-	578,949	575,151	(3,798)	575,151	499,997
525221AJ6	502,913	-	502,913	502,636	(277)	502,636	524,046
61915RBZ8	173,679	-	173,679	173,638	(41)	173,638	155,279
86358HHX0	176,678	-	176,678	173,936	(2,742)	173,936	129,387
92978EAA2	80,634	-	80,634	80,479	(155)	80,479	72,910
93935PAH2	112,081	-	112,081	105,729	(6,352)	105,729	109,259
05946XYP2	267,693	-	267,693	266,462	(1,231)	266,462	225,954
86360UAF3	977,832	-	977,832	929,807	(48,025)	929,807	761,473
92922FWU8	357,222	-	357,222	355,654	(1,568)	355,654	335,837
12669GTE1	4,194	-	4,194	3,937	(257)	3,937	4,201
32051DCJ9	41,478	-	41,478	41,458	(20)	41,458	39,754
36298XAA0	4,842,551	-	4,842,551	4,688,750	(153,801)	4,688,750	4,460,917
92922FBW7	31,480	-	31,480	29,553	(1,927)	29,553	29,205
Totals	\$ 16,432,523	\$ -	\$ 16,432,523	\$ 15,955,963	\$ (476,560)	\$ 15,955,963	\$ 15,431,923

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2023:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
12624QAC7	\$ 3,512,422	\$ -	\$ 3,512,422	\$ 3,120,715	\$ (391,707)	\$ 3,120,715	\$ 1,664,875
12624SAE9	2,546,182	-	2,546,182	2,252,873	(293,309)	2,252,873	672,000
36192RAL6	2,950,000	-	2,950,000	1,475,000	(1,475,000)	1,475,000	527,313
040104RV5	1,466,218	-	1,466,218	1,404,587	(61,631)	1,404,587	1,357,561
040104TF8	44,673	-	44,673	40,179	(4,494)	40,179	34,156
040104TG6	471,373	-	471,373	395,907	(75,466)	395,907	442,138
04012XAC9	136,023	-	136,023	130,363	(5,660)	130,363	111,736
1248MBAF2	12,589,914	-	12,589,914	5,496,141	(7,093,773)	5,496,141	5,479,168
1248MGJ3	43,914	-	43,914	42,609	(1,305)	42,609	35,260
17311YAC7	1,273,018	-	1,273,018	1,228,216	(44,802)	1,228,216	1,264,914
30247DAD3	572,150	-	572,150	552,362	(19,788)	552,362	512,472
35729RAE6	3,632,752	-	3,632,752	3,523,491	(109,261)	3,523,491	3,272,827
40431KAE0	2,092,929	-	2,092,929	2,043,034	(49,895)	2,043,034	2,095,485
45071KDD3	419,880	-	419,880	359,858	(60,022)	359,858	365,022

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

46629NAC7	34,588	-	34,588	32,979	(1,609)	32,979	27,783
46630KAA4	158,523	-	158,523	155,152	(3,371)	155,152	149,476
617463AA2	8,734	-	8,734	7,949	(785)	7,949	6,705
61749BAB9	61,518	-	61,518	60,870	(648)	60,870	64,742
61750FAE0	412,694	-	412,694	394,112	(18,582)	394,112	366,377
61750MAB1	3,264	-	3,264	3,129	(135)	3,129	3,014
61755AAB2	3,183	-	3,183	2,639	(544)	2,639	2,526
86359DXD4	193,613	-	193,613	183,061	(10,552)	183,061	184,312
86363HAB8	36,193	-	36,193	34,244	(1,949)	34,244	30,923
92926SAB2	493	-	493	381	(112)	381	382
93934XAB9	137,528	-	137,528	122,528	(15,000)	122,528	129,850
12668ALV5	1,990,831	-	1,990,831	1,755,977	(234,854)	1,755,977	1,754,077
22540VG71	36,270	-	36,270	36,232	(38)	36,232	37,823
22943HAD8	3,510,613	-	3,510,613	3,380,974	(129,639)	3,380,974	1,886,340
32053LAA0	19,363	-	19,363	19,262	(101)	19,262	18,644
45254TRX4	23,933	-	23,933	23,574	(359)	23,574	23,161
45254TSM7	615,674	-	615,674	594,492	(21,182)	594,492	528,927
45660LAU3	57,004	-	57,004	56,426	(578)	56,426	55,897
45660LYW3	797,875	-	797,875	786,087	(11,788)	786,087	724,845
466247XE8	622,921	-	622,921	612,163	(10,758)	612,163	537,075
525221AJ6	561,909	-	561,909	502,260	(59,649)	502,260	551,875
61915RBZ8	178,926	-	178,926	178,879	(47)	178,879	164,881
65535VRK6	479,926	-	479,926	469,432	(10,494)	469,432	495,515
75115DAH8	3,502	-	3,502	3,266	(236)	3,266	3,118
761118FM5	1,722,865	-	1,722,865	1,583,656	(139,209)	1,583,656	1,584,522
76112BUE8	107,208	-	107,208	96,659	(10,549)	96,659	122,032
855541AC2	219,356	-	219,356	180,352	(39,004)	180,352	226,114
86359BLQ2	792,449	-	792,449	779,863	(12,586)	779,863	701,652
92978EAA2	83,791	-	83,791	81,555	(2,236)	81,555	79,259
92979DAA3	15,795	-	15,795	15,379	(416)	15,379	15,469
41161PWB5	723,595	-	723,595	713,315	(10,280)	713,315	587,280
45660N5H4	1,202,840	-	1,202,840	1,156,288	(46,552)	1,156,288	1,159,986
45660NT88	14,960	-	14,960	14,830	(130)	14,830	14,372
92922F5T1	1,438,953	-	1,438,953	1,412,027	(26,926)	1,412,027	1,244,390
939336X65	1,599,517	-	1,599,517	1,419,593	(179,924)	1,419,593	1,427,509
05949CCB0	34,367	-	34,367	34,278	(89)	34,278	35,010
32051DCJ9	44,524	-	44,524	44,461	(63)	44,461	43,405
36228FWU6	150,442	-	150,442	141,049	(9,393)	141,049	147,677
362341VU0	1,530,315	-	1,530,315	1,520,759	(9,556)	1,520,759	1,428,432
36298XAA0	4,788,213	-	4,788,213	4,743,999	(44,214)	4,743,999	4,501,267
5899292N7	48,660	-	48,660	47,935	(725)	47,935	46,874
589929N38	42,499	-	42,499	40,236	(2,263)	40,236	39,978
59020UNZ4	89,539	-	89,539	75,877	(13,662)	75,877	85,656
86359DME4	439,975	-	439,975	415,180	(24,795)	415,180	400,433
929227ZF6	6,804	-	6,804	883	(5,921)	883	3,055
Totals	\$ 56,797,193	\$ -	\$ 56,797,193	\$ 45,999,577	\$ (10,797,616)	\$ 45,999,577	\$ 39,477,567

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2022:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
12624QAC7	\$ 3,800,115	\$ -	\$ 3,800,115	\$ 3,420,115	\$ (380,000)	\$ 3,420,115	\$ 1,588,875
12624SAE9	2,716,498	-	2,716,498	2,435,538	(280,960)	2,435,538	835,883
36192RAL6	2,950,670	-	2,950,670	1,475,670	(1,475,000)	1,475,670	1,096,111
00442FAB8	54,320	-	54,320	42,042	(12,278)	42,042	9,321
02660CAH3	30,449	-	30,449	27,509	(2,940)	27,509	621

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

040104RV5	1,538,602	-	1,538,602	1,447,321	(91,281)	1,447,321	1,361,477
040104TF8	46,015	-	46,015	44,165	(1,850)	44,165	34,412
04012XAC9	140,344	-	140,344	134,035	(6,309)	134,035	114,094
04544TAB7	29,637	-	29,637	8,031	(21,606)	8,031	27,105
12479DAC2	1,754,671	-	1,754,671	1,705,748	(48,923)	1,705,748	1,321,385
1248MGAJ3	45,771	-	45,771	43,936	(1,835)	43,936	36,622
17311YAC7	1,339,319	-	1,339,319	1,249,956	(89,363)	1,249,956	1,251,680
30247DAD3	615,686	-	615,686	576,172	(39,514)	576,172	523,602
35729RAE6	3,769,442	-	3,769,442	3,620,540	(148,902)	3,620,540	3,166,561
40431KAE0	2,102,171	-	2,102,171	2,066,603	(35,567)	2,066,603	2,080,134
46630KAA4	163,709	-	163,709	160,394	(3,316)	160,394	150,262
57643LMP8	699,246	-	699,246	655,527	(43,720)	655,527	703,992
590212AB2	36,752	-	36,752	32,892	(3,860)	32,892	35,553
61749BAB9	25,730	-	25,730	18,784	(6,946)	18,784	19,869
61750FAE0	427,971	-	427,971	409,815	(18,156)	409,815	364,414
61750MAB1	3,966	-	3,966	3,252	(714)	3,252	3,061
84752CAE7	780,353	-	780,353	534,007	(246,346)	534,007	735,662
86359DXD4	207,910	-	207,910	194,222	(13,688)	194,222	192,670
86363HAB8	38,745	-	38,745	36,881	(1,864)	36,881	32,197
05535DAN4	815,322	-	815,322	781,142	(34,180)	781,142	668,809
12667GKG7	48,651	-	48,651	47,599	(1,052)	47,599	49,753
17025RAA3	274,474	-	274,474	222,741	(51,733)	222,741	264,605
22943HAD8	3,639,676	-	3,639,676	3,553,679	(85,998)	3,553,679	1,966,703
251563FB3	21,743	-	21,743	18,668	(3,075)	18,668	21,315
32053LAA0	20,430	-	20,430	19,665	(765)	19,665	19,195
362290AC2	165,551	-	165,551	119,985	(45,566)	119,985	163,292
43739EAP2	1,491,643	-	1,491,643	1,378,947	(112,696)	1,378,947	1,338,336
45254TRX4	27,269	-	27,269	24,861	(2,408)	24,861	24,629
45660LYW3	807,355	-	807,355	801,731	(5,623)	801,731	740,968
466247XE8	648,455	-	648,455	636,766	(11,689)	636,766	552,507
589929X29	476,677	-	476,677	442,351	(34,326)	442,351	455,505
59020UW43	96,706	-	96,706	67,631	(29,075)	67,631	81,213
61915RBZ8	182,035	-	182,035	180,158	(1,878)	180,158	165,479
65535VRK6	496,060	-	496,060	477,703	(18,357)	477,703	503,077
86358HHX0	185,982	-	185,982	180,224	(5,758)	180,224	138,376
86359BLQ2	912,392	-	912,392	860,886	(51,506)	860,886	788,258
92978EAA2	87,160	-	87,160	83,990	(3,170)	83,990	80,341
41161PHU0	1,288,335	-	1,288,335	1,111,121	(177,215)	1,111,121	1,242,875
41161PTP8	79,162	-	79,162	70,296	(8,866)	70,296	69,500
41161PWB5	748,794	-	748,794	743,267	(5,528)	743,267	642,772
45660N5H4	1,326,680	-	1,326,680	1,291,747	(34,933)	1,291,747	1,293,674
05949CCB0	37,242	-	37,242	34,365	(2,878)	34,365	35,868
36298XAA0	4,996,628	-	4,996,628	4,820,011	(176,617)	4,820,011	4,541,703
36298XAB8	4,960,140	-	4,960,140	4,317,655	(642,484)	4,317,655	4,428,229
Totals	\$ 47,152,655	\$ -	\$ 47,152,655	\$ 42,630,344	\$ (4,522,311)	\$ 42,630,344	\$ 35,962,545

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2022:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
01853GAB6	\$ 14,137	\$ -	\$ 14,137	\$ 14,133	\$ (4)	\$ 14,133	\$ 81,535
02660CAH3	30,416	-	30,416	30,133	(283)	30,133	520
040104RV5	1,615,798	-	1,615,798	1,524,246	(91,552)	1,524,246	1,400,628
040104TF8	51,554	-	51,554	45,567	(5,987)	45,567	35,698
040104TG6	548,457	-	548,457	448,751	(99,706)	448,751	462,045
04012XAC9	158,236	-	158,236	138,996	(19,240)	138,996	114,648
1248MGAJ3	48,376	-	48,376	46,059	(2,317)	46,059	37,828
14454AAB5	676,443	-	676,443	675,900	(543)	675,900	797,469

35729RAE6	4,081,381	-	4,081,381	3,766,230	(315,151)	3,766,230	3,254,010
40431KAE0	2,165,192	-	2,165,192	2,079,404	(85,788)	2,079,404	2,080,910

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

46629NAC7	37,064	-	37,064	34,532	(2,532)	34,532	28,639
46630KAA4	168,908	-	168,908	166,176	(2,733)	166,176	156,211
57643LMP8	794,964	-	794,964	695,958	(99,006)	695,958	707,626
617463AA2	9,759	-	9,759	8,712	(1,047)	8,712	6,788
61750FAE0	472,290	-	472,290	426,190	(46,100)	426,190	370,275
617526AE8	213,790	-	213,790	183,317	(30,473)	183,317	205,107
86359DXD4	258,372	-	258,372	209,421	(48,950)	209,421	209,160
86363HAB8	42,386	-	42,386	39,363	(3,023)	39,363	33,395
93934XAB9	173,541	-	173,541	135,596	(37,945)	135,596	152,650
05535DAN4	846,722	-	846,722	844,091	(2,632)	844,091	719,154
12667GKG7	53,610	-	53,610	50,015	(3,595)	50,015	52,574
12668ACY9	196,165	-	196,165	158,127	(38,037)	158,127	199,829
18974BAA7	139,604	-	139,604	135,673	(3,931)	135,673	142,094
22540VG71	39,290	-	39,290	38,205	(1,085)	38,205	39,865
22943HAD8	3,726,422	-	3,726,422	3,648,804	(77,618)	3,648,804	1,947,539
45254TSM7	666,066	-	666,066	648,569	(17,497)	648,569	557,450
466247XE8	670,770	-	670,770	665,673	(5,097)	665,673	576,833
525221AJ6	554,561	-	554,561	553,790	(771)	553,790	552,476
59020UW43	99,571	-	99,571	98,502	(1,069)	98,502	80,640
65535VRK6	537,959	-	537,959	492,267	(45,692)	492,267	506,957
75116CET9	52,218	-	52,218	37,480	(14,738)	37,480	51,726
92926UAC5	57,744	-	57,744	45,834	(11,910)	45,834	55,826
92978EAA2	93,378	-	93,378	87,280	(6,098)	87,280	83,812
23332UCM4	26,121	-	26,121	24,163	(1,958)	24,163	25,263
41161PTP8	76,675	-	76,675	72,259	(4,416)	72,259	68,493
41161PWB5	796,629	-	796,629	761,585	(35,044)	761,585	655,513
45660N5H4	1,475,897	-	1,475,897	1,375,793	(100,104)	1,375,793	1,309,005
362341VU0	1,644,583	-	1,644,583	1,609,277	(35,306)	1,609,277	1,524,505
Totals	\$ 23,315,048	\$ -	\$ 23,315,048	\$ 22,016,070	\$ (1,298,978)	\$ 22,016,070	\$ 19,284,696

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2022:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
01853GAB6	\$ 66,515	\$ -	\$ 66,515	\$ 11,444	\$ (55,072)	\$ 11,444	\$ 88,216
040104RV5	1,784,407	-	1,784,407	1,603,660	(180,747)	1,603,660	1,520,334
040104TF8	38,441	-	38,441	35,870	(2,572)	35,870	27,369
04012XAC9	110,303	-	110,303	106,039	(4,264)	106,039	85,613
1248MGAJ3	33,572	-	33,572	31,812	(1,760)	31,812	27,009
14454AAB5	881,442	-	881,442	677,715	(203,728)	677,715	840,850
35729RAE6	4,202,719	-	4,202,719	4,089,490	(113,229)	4,089,490	3,504,758
45071KDD3	273,858	-	273,858	258,285	(15,573)	258,285	253,045
61749BAB9	51,130	-	51,130	41,427	(9,703)	41,427	50,025
86359DXD4	272,114	-	272,114	262,835	(9,280)	262,835	230,996
86363HAB8	33,458	-	33,458	28,887	(4,571)	28,887	26,054
05535DAN4	1,158,770	-	1,158,770	873,964	(284,806)	873,964	779,790
07387AFX8	65,702	-	65,702	54,499	(11,203)	54,499	65,889
12668ABP9	177,942	-	177,942	145,191	(32,751)	145,191	170,379
18974BAA7	163,686	-	163,686	159,493	(4,193)	159,493	158,996
18974BAN9	77,869	-	77,869	70,973	(6,896)	70,973	75,478
22943HAD8	4,013,588	-	4,013,588	3,751,800	(261,788)	3,751,800	2,037,389
45254TRX4	45,557	-	45,557	40,333	(5,224)	40,333	42,158
525221AJ6	718,882	-	718,882	583,189	(135,692)	583,189	606,787
59020UW43	106,578	-	106,578	102,698	(3,880)	102,698	124,978
761118FM5	1,217,616	-	1,217,616	1,142,589	(75,026)	1,142,589	1,144,285
85554NAG5	94,558	-	94,558	80,862	(13,696)	80,862	90,860
92978EAA2	67,304	-	67,304	65,210	(2,094)	65,210	61,610
45660N5H4	1,537,499	-	1,537,499	1,502,180	(35,320)	1,502,180	1,379,463

12669GXW6	44,815	-	44,815	41,990	(2,826)	41,990	77,371
589929N38	68,312	-	68,312	63,956	(4,356)	63,956	65,216
Totals	\$ 17,306,639	\$ -	\$ 17,306,639	\$ 15,826,391	\$ (1,480,248)	\$ 15,826,391	\$ 13,534,918

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2022:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
00256DAA0	\$ 1,762,699	\$ -	\$ 1,762,699	\$ 1,364,210	\$ (398,489)	\$ 1,364,210	\$ 1,122,333
07388VAH1	2,364,730	-	2,364,730	244,594	(2,120,137)	244,594	244,594
22545XBB8	1,683,921	-	1,683,921	211,871	(1,472,050)	211,871	210,934
00442FAB8	70,075	-	70,075	52,264	(17,811)	52,264	10,685
040104TF8	59,249	-	59,249	53,852	(5,397)	53,852	41,892
040104TG6	623,388	-	623,388	531,410	(91,978)	531,410	545,952
04012XAC9	178,777	-	178,777	162,199	(16,578)	162,199	136,446
1248MGJ3	52,182	-	52,182	51,033	(1,149)	51,033	45,331
17311YAC7	1,623,994	-	1,623,994	1,327,822	(296,172)	1,327,822	1,502,602
24763LFY1	134,155	-	134,155	67,703	(66,452)	67,703	106,050
35729RAE6	4,416,912	-	4,416,912	4,231,274	(185,638)	4,231,274	3,947,591
40431KAE0	2,521,316	-	2,521,316	2,214,702	(306,614)	2,214,702	2,513,960
45071KDD3	488,363	-	488,363	436,903	(51,460)	436,903	448,752
55291KAC1	633,248	-	633,248	169,402	(463,846)	169,402	598,172
57643LMP8	906,102	-	906,102	809,314	(96,788)	809,314	815,499
617463AA2	10,553	-	10,553	9,894	(659)	9,894	8,101
61750FAE0	509,354	-	509,354	473,873	(35,481)	473,873	435,242
617526AE8	262,688	-	262,688	214,229	(48,459)	214,229	243,939
86359DXD4	304,264	-	304,264	279,462	(24,802)	279,462	275,224
07384YPP5	314,885	-	314,885	207,555	(107,330)	207,555	66,352
32053LAA0	27,875	-	27,875	22,820	(5,055)	22,820	25,221
45660LAU3	78,731	-	78,731	75,334	(3,397)	75,334	76,824
59020UW43	176,900	-	176,900	108,489	(68,411)	108,489	132,229
65535VRK6	592,663	-	592,663	536,987	(55,676)	536,987	561,983
761118FM5	1,932,729	-	1,932,729	1,911,872	(20,857)	1,911,872	1,863,619
76112HAE7	13,536	-	13,536	10,283	(3,253)	10,283	13,495
92978EAA2	102,806	-	102,806	97,782	(5,024)	97,782	94,757
93935PAH2	137,585	-	137,585	115,483	(22,102)	115,483	131,766
41161PWB5	884,324	-	884,324	852,993	(31,331)	852,993	771,130
45660N5H4	1,600,750	-	1,600,750	1,533,921	(66,829)	1,533,921	1,444,261
36298XAB8	5,320,204	-	5,320,204	5,307,865	(12,338)	5,307,865	5,034,048
55274SAM3	177,495	-	177,495	25,133	(152,362)	25,133	29,827
59024WAB3	137,567	-	137,567	119,223	(18,344)	119,223	142,528
94984GAD9	31,976	-	31,976	26,026	(5,950)	26,026	33,031
Totals	\$ 30,135,997	\$ -	\$ 30,135,997	\$ 23,857,778	\$ (6,278,218)	\$ 23,857,778	\$ 23,674,371

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2021:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
040104TF8	\$ 59,686	\$ -	\$ 59,686	\$ 59,300	\$ (386)	\$ 59,300	\$ 49,870
04012XAC9	130,314	-	130,314	122,160	(8,154)	122,160	107,581
1248MGJ3	35,096	-	35,096	34,855	(241)	34,855	31,996
35729RAE6	4,028,108	-	4,028,108	3,999,290	(28,818)	3,999,290	3,995,059
617463AA2	6,685	-	6,685	5,767	(918)	5,767	5,247
61749BAB9	61,698	-	61,698	51,363	(10,335)	51,363	60,638
61750FAE0	342,930	-	342,930	319,304	(23,626)	319,304	307,808
61750MAB1	3,456	-	3,456	3,113	(343)	3,113	3,182
86359DXD4	335,476	-	335,476	308,315	(27,161)	308,315	309,361
92926SAB2	558	-	558	494	(64)	494	521
45660LYW3	677,413	-	677,413	675,162	(2,251)	675,162	630,760
79548KXQ6	51,835	-	51,835	37,121	(14,714)	37,121	65,254

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

92978EAA2	75,569	-	75,569	72,635	(2,934)	72,635	72,325
41161PWB5	822,378	-	822,378	776,768	(45,610)	776,768	706,114
55274SAM3	27,413	-	27,413	24,861	(2,552)	24,861	23,482
Totals	\$ 6,658,614	\$ -	\$ 6,658,615	\$ 6,490,508	\$ (168,107)	\$ 6,490,508	\$ 6,369,198

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2021:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
040104TF8	\$ 59,686	\$ -	\$ 59,686	\$ 59,300	\$ (386)	\$ 59,300	\$ 49,870
04012XAC9	130,314	-	130,314	122,160	(8,154)	122,160	107,581
1248MGJ3	35,096	-	35,096	34,855	(241)	34,855	31,996
35729RAE6	4,028,108	-	4,028,108	3,999,290	(28,818)	3,999,290	3,995,059
617463AA2	6,685	-	6,685	5,767	(918)	5,767	5,247
61749BAB9	61,698	-	61,698	51,363	(10,335)	51,363	60,638
61750FAE0	342,930	-	342,930	319,304	(23,626)	319,304	307,808
61750MAB1	3,456	-	3,456	3,113	(343)	3,113	3,182
86359DXD4	335,476	-	335,476	308,315	(27,161)	308,315	309,361
92926SAB2	558	-	558	494	(64)	494	521
45660LYW3	677,413	-	677,413	675,162	(2,251)	675,162	630,760
79548KXQ6	51,835	-	51,835	37,121	(14,714)	37,121	65,254
92978EAA2	75,569	-	75,569	72,635	(2,934)	72,635	72,325
41161PWB5	822,378	-	822,378	776,768	(45,610)	776,768	706,114
55274SAM3	27,413	-	27,413	24,861	(2,552)	24,861	23,482
Totals	\$ 6,658,614	\$ -	\$ 6,658,615	\$ 6,490,508	\$ (168,107)	\$ 6,490,508	\$ 6,369,198

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2021:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
00442FAB8	\$ 95,903	\$ -	\$ 95,903	\$ 70,276	\$ (25,627)	\$ 70,276	\$ 60,821
86359DXD4	359,657	-	359,657	339,761	(19,896)	339,761	337,895
05535DAN4	1,260,315	-	1,260,315	1,255,426	(4,889)	1,255,426	1,020,099
073879QF8	247,750	-	247,750	226,078	(21,672)	226,078	256,430
45660LYW3	907,047	-	907,047	906,647	(400)	906,647	879,977
92978EAA2	110,354	-	110,354	108,384	(1,970)	108,384	106,564
41161PWB5	1,049,397	-	1,049,397	1,023,087	(26,310)	1,023,087	908,082
55274SAM3	30,959	-	30,959	26,064	(4,895)	26,064	25,345
Totals	\$ 4,061,382	\$ -	\$ 4,061,382	\$ 3,955,723	\$ (105,659)	\$ 3,955,723	\$ 3,595,213

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2021:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
040104TG6	\$ 751,483	\$ -	\$ 751,483	\$ 596,747	\$ (154,736)	\$ 596,747	\$ 700,223
05535DCF9	2,412,525	-	2,412,525	2,168,139	(244,386)	2,168,139	2,608,461
40431KAE0	2,389,667	-	2,389,667	2,348,253	(41,414)	2,348,253	2,745,165
61750FAE0	555,370	-	555,370	534,914	(20,456)	534,914	493,887
86359DXD4	394,726	-	394,726	364,962	(29,764)	364,962	369,964
05535DAN4	1,386,766	-	1,386,766	1,038,889	(347,877)	1,038,889	1,141,961
45660LYW3	959,375	-	959,375	942,757	(16,618)	942,757	927,049
79548KXQ6	121,590	-	121,590	96,976	(24,616)	96,976	97,070
92978EAA2	115,502	-	115,502	112,103	(3,399)	112,103	110,484
41161PWB5	1,112,829	-	1,112,829	1,079,359	(33,470)	1,079,359	969,681
576433H33	1,119,491	-	1,119,491	1,071,784	(47,707)	1,071,784	1,074,403
55274SAM3	33,318	-	33,318	31,698	(1,620)	31,698	85,553
Totals	\$ 11,352,643	\$ -	\$ 11,352,642	\$ 10,386,581	\$ (966,063)	\$ 10,386,581	\$ 11,323,900

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2021:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
36828QQJ8	\$ 5,796,000	\$ -	\$ 5,796,000	\$ -	\$ (5,796,000)	\$ -	\$ -
05535DCF9	2,560,946	-	2,560,946	2,505,561	(55,385)	2,505,561	2,647,762
61750FAE0	582,728	-	582,728	558,079	(24,649)	558,079	500,569
18974BAA7	203,962	-	203,962	193,231	(10,731)	193,231	197,038
22540V3F7	124,724	-	124,724	11,082	(113,642)	11,082	3,496
92978EAA2	123,118	-	123,118	119,363	(3,755)	119,363	115,107
41161PWB5	1,183,481	-	1,183,481	1,153,338	(30,143)	1,153,338	1,017,022
12669GXW6	153,925	-	153,925	20,286	(133,639)	20,286	173,435
55274SAM3	38,192	-	38,192	33,418	(4,774)	33,418	84,650
86359DME4	480,180	-	480,180	480,135	(45)	480,135	498,095
Totals	\$ 11,247,256	\$ -	\$ 11,247,257	\$ 5,074,493	\$ (6,172,764)	\$ 5,074,493	\$ 5,237,174

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2020:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
01853GAB6	\$ 166,318	\$ -	\$ 166,318	\$ 58,609	\$ (107,709)	\$ 58,609	\$ 136,619
05535DCF9	2,639,139	-	2,639,139	2,595,116	(44,023)	2,595,116	2,812,127
61750FAE0	594,740	-	594,740	584,887	(9,853)	584,887	530,736
61750MAB1	4,675	-	4,675	4,502	(173)	4,502	4,545
92926SAB2	585	-	585	567	(18)	567	562
124860CB1	21,523	-	21,523	14,872	(6,651)	14,872	17,887
18974BAA7	205,451	-	205,451	204,843	(608)	204,843	186,946
18974BAN9	101,669	-	101,669	101,513	(156)	101,513	98,300
2254W0NK7	89,902	-	89,902	23,726	(66,176)	23,726	94,611
45660LYW3	1,074,456	-	1,074,456	1,035,449	(39,007)	1,035,449	1,020,046
65535VRK6	681,735	-	681,735	601,631	(80,104)	601,631	653,481
79548KXQ6	99,323	-	99,323	98,725	(598)	98,725	92,899
92978EAA2	130,042	-	130,042	125,448	(4,594)	125,448	119,223
23332UBW3	26,310	-	26,310	21,116	(5,193)	21,116	30,347
576433H33	1,207,614	-	1,207,614	1,145,808	(61,806)	1,145,808	1,116,853
125435AA5	1,635,577	-	1,635,577	1,543,519	(92,058)	1,543,519	1,596,490
36298XAA0	6,639,520	-	6,639,520	5,802,921	(836,599)	5,802,921	6,153,831
55274SAM3	61,225	-	61,225	42,760	(18,465)	42,760	93,792
86359DME4	673,784	-	673,784	662,791	(10,993)	662,791	698,159
929227ZF6	18,319	-	18,319	5,496	(12,823)	5,496	16,063
Totals	\$ 16,071,907	\$ -	\$ 16,071,907	\$ 14,674,300	\$ (1,397,607)	\$ 14,674,300	\$ 15,473,517

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2020:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
US05618HAE53	\$ 555,162	\$ -	\$ 555,162	\$ 387,040	\$ (168,122)	\$ 387,040	\$ 162,575
00442FAB8	144,957	-	144,957	79,275	(65,682)	79,275	112,060
05535DCF9	2,755,413	-	2,755,413	2,649,186	(106,228)	2,649,186	2,553,142
46630KAA4	191,718	-	191,718	184,342	(7,376)	184,342	179,699
61749BAB9	105,432	-	105,432	91,620	(13,812)	91,620	88,204
61750MAB1	4,837	-	4,837	4,672	(165)	4,672	3,421
92926SAB2	604	-	604	588	(16)	588	438

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

07384YPP5	12,990	-	12,990	9,466	(3,524)	9,466	35,174
073879QF8	45,111	-	45,111	43,889	(1,222)	43,889	39,772
17307GRU4	104,250	-	104,250	55,590	(48,659)	55,590	91,680
18974BAA7	215,833	-	215,833	212,231	(3,602)	212,231	183,053
18974BAN9	106,359	-	106,359	104,851	(1,507)	104,851	97,631
9393365V1	399,194	-	399,194	394,263	(4,932)	394,263	364,935
23332UBW3	31,650	-	31,650	29,218	(2,432)	29,218	22,244
12669GWN7	849,557	-	849,557	799,224	(50,333)	799,224	782,638
12669GXW6	244,251	-	244,251	233,647	(10,604)	233,647	223,233
32051DCK6	79,208	-	79,208	61,819	(17,389)	61,819	82,998
36298XAA0	7,738,893	-	7,738,893	7,511,130	(227,763)	7,511,130	7,120,125
36298XAB8	7,666,120	-	7,666,120	6,250,751	(1,415,369)	6,250,751	6,539,292
45660LY94	13,115	-	13,115	6,394	(6,721)	6,394	26,528
74951PBT4	110,729	-	110,729	51,052	(59,676)	51,052	153,185
Totals	\$ 21,375,383	\$ -	\$ 21,375,383	\$ 19,160,250	\$ (2,215,134)	\$ 19,160,250	\$ 18,862,027

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2020:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
17307GRU4	\$ 107,326	\$ -	\$ 107,326	\$ 77,392	\$ (29,934)	\$ 77,392	\$ 160,449
18974BAA7	245,427	-	245,427	235,230	(10,197)	235,230	201,416
18974BAN9	119,509	-	119,509	114,571	(4,938)	114,571	107,924
362290AC2	220,776	-	220,776	219,541	(1,235)	219,541	307,360
79548KXQ6	172,175	-	172,175	170,007	(2,168)	170,007	130,248
855541AC2	508,940	-	508,940	384,558	(124,383)	384,558	460,800
9393365V1	433,313	-	433,313	415,261	(18,053)	415,261	356,247
45660LY94	28,987	-	28,987	13,258	(15,729)	13,258	21,174
57643QAE5	2,203,118	-	2,203,118	1,819,560	(383,558)	1,819,560	2,367,000
74951PBT4	260,811	-	260,811	143,231	(117,579)	143,231	157,616
86359DMC8	5,799,490	-	5,799,490	5,333,524	(465,966)	5,333,524	4,907,737
92990GAE3	80,251	-	80,251	66,477	(13,773)	66,477	71,880
Totals	\$ 10,180,123	\$ -	\$ 10,180,123	\$ 8,992,610	\$ (1,187,513)	\$ 8,992,610	\$ 9,249,851

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2020:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
05535DCF9	\$ 3,012,907	\$ -	\$ 3,012,907	\$ 2,862,429	\$ (150,478)	\$ 2,862,429	\$ 2,528,432
24763LFY1	147,758	-	147,758	146,827	(931)	146,827	180,454
45071KDD3	575,329	-	575,329	510,787	(64,542)	510,787	491,576
07384YPP5	33,493	-	33,493	28,061	(5,431)	28,061	46,723
12667GKG7	93,290	-	93,290	83,622	(9,668)	83,622	98,905
17307GRU4	114,325	-	114,325	112,699	(1,625)	112,699	157,144
362290AC2	316,883	-	316,883	225,907	(90,976)	225,907	322,987
59020UW43	214,183	-	214,183	182,719	(31,463)	182,719	200,181
65535VRK6	716,497	-	716,497	699,498	(16,998)	699,498	646,333
75115DAH8	6,842	-	6,842	6,564	(279)	6,564	6,397
76112BUE8	181,578	-	181,578	148,845	(32,733)	148,845	129,998
79548KXQ6	187,063	-	187,063	182,973	(4,090)	182,973	137,728
92926UAC5	136,220	-	136,220	130,734	(5,486)	130,734	130,957
23332UBW3	46,195	-	46,195	32,143	(14,052)	32,143	24,852
12669GWN7	889,281	-	889,281	871,126	(18,155)	871,126	863,235
32051DCK6	88,205	-	88,205	86,848	(1,358)	86,848	89,678
362334CN2	14,634	-	14,634	11,177	(3,457)	11,177	13,996
466247K93	7,584	-	7,584	6,335	(1,249)	6,335	7,318
57645LAA2	18,017,521	-	18,017,521	13,868,050	(4,149,471)	13,868,050	18,607,055
Totals	\$ 24,799,788	\$ -	\$ 24,799,788	\$ 20,197,344	\$ (4,602,443)	\$ 20,197,344	\$ 24,683,947

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2019:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
24763LFY1	\$ 182,113	\$ -	\$ 182,113	\$ 160,832	\$ (21,281)	\$ 160,832	\$ 200,613
05535DAN4	1,930,918	-	1,930,918	1,855,207	(75,711)	1,855,207	1,598,238
07384YPP5	187,700	-	187,700	39,691	(148,009)	39,691	71,760
17307GRU4	164,558	-	164,558	133,524	(31,034)	133,524	229,670
18974BAN9	134,619	-	134,619	125,398	(9,221)	125,398	126,170
65535VRK6	797,949	-	797,949	712,007	(85,942)	712,007	774,700
79548KXQ6	207,254	-	207,254	192,282	(14,972)	192,282	113,588
85554NAG5	194,730	-	194,730	158,214	(36,515)	158,214	187,575
12669FXR9	117,999	-	117,999	114,307	(3,692)	114,307	101,165
23332UBW3	74,561	-	74,561	47,819	(26,742)	47,819	35,659
Totals	\$ 3,992,400	\$ -	\$ 3,992,400	\$ 3,539,281	\$ (453,119)	\$ 3,539,281	\$ 3,439,138

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2019:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
12667F2A2	\$ 642,800	\$ -	\$ 642,800	\$ 484,346	\$ (158,455)	\$ 484,346	\$ 68,241
32053LAA0	47,447	-	47,447	40,280	(7,167)	40,280	47,846
761118FM5	2,843,393	-	2,843,393	2,789,133	(54,260)	2,789,133	2,918,992
79548KXQ6	297,379	-	297,379	277,239	(20,140)	277,239	60,979
23332UBW3	78,084	-	78,084	76,934	(1,151)	76,934	43,636
576433H33	1,579,401	-	1,579,401	1,448,247	(131,155)	1,448,247	1,448,863
12669GWN7	1,037,688	-	1,037,688	957,205	(80,484)	957,205	936,853
17309FAE8	161,243	-	161,243	129,536	(31,707)	129,536	159,357
36298XAA0	10,097,887	-	10,097,887	8,887,246	(1,210,641)	8,887,246	8,841,272
92990GAE3	86,314	-	86,314	85,680	(634)	85,680	87,117
US74951PBV94	37,392	-	37,392	16,087	(21,305)	16,087	26,602
Totals	\$ 16,909,029	\$ -	\$ 16,909,029	\$ 15,191,932	\$ (1,717,097)	\$ 15,191,932	\$ 14,639,756

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2019:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
61750MAB1	\$ 4,942	\$ -	\$ 4,942	\$ 4,899	\$ (42)	\$ 4,899	\$ 4,344
18974BAN9	143,913	-	143,913	143,911	(2)	143,911	141,999
761118FM5	3,338,972	-	3,338,972	3,276,460	(62,512)	3,276,460	3,468,889
79548KXQ6	335,309	-	335,309	321,864	(13,445)	321,864	218,663
55274SAM3	114,173	-	114,173	79,608	(34,565)	79,608	119,029
57643QAE5	3,042,722	-	3,042,722	2,360,287	(682,436)	2,360,287	3,180,695
Totals	\$ 6,980,030	\$ -	\$ 6,980,030	\$ 6,187,029	\$ (793,001)	\$ 6,187,029	\$ 7,133,620

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2019:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
61750MAB1	\$ 5,275	\$ -	\$ 5,275	\$ 4,933	\$ (341)	\$ 4,933	\$ 4,989
65106FAG7	232,843	-	232,843	215,726	(17,118)	215,726	6,316
18974BAA7	285,889	-	285,889	270,801	(15,088)	270,801	278,616
18974BAN9	149,774	-	149,774	139,333	(10,441)	139,333	148,234
22541QQR6	1,569	-	1,569	-	(1,569)	-	1
32051GCF0	22,786	-	22,786	(6,720)	(29,507)	(6,720)	17,553
761118FM5	3,259,303	-	3,259,303	3,218,368	(40,935)	3,218,368	3,244,154
17309FAE8	200,512	-	200,512	200,501	(11)	200,501	208,828
466247UG6	467,713	-	467,713	452,359	(15,354)	452,359	459,812
57643QAE5	3,114,325	-	3,114,325	3,109,376	(4,949)	3,109,376	3,256,107
US74951PBV94	51,011	-	51,011	29,960	(21,051)	29,960	58,411
Totals	\$ 7,791,000	\$ -	\$ 7,791,000	\$ 7,634,637	\$ (156,362)	\$ 7,634,637	\$ 7,683,021

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
65106FAG7	\$ 205,885	\$ -	\$ 205,885	\$ 17,668	\$ (188,218)	\$ 17,668	\$ 21,031
18974BAA7	306,428	-	306,428	295,291	(11,137)	295,291	294,986
22541QQR6	28,742	-	28,742	(9,704)	(38,446)	(9,704)	1
32051GCF0	32,493	-	32,493	20,481	(12,012)	20,481	20,063
17309FAE8	203,743	-	203,743	202,326	(1,417)	202,326	201,875
57643QAE5	3,657,695	-	3,657,695	3,177,611	(480,084)	3,177,611	3,365,017
92990GAE3	115,186	-	115,186	111,886	(3,300)	111,886	111,541
Totals	\$ 4,550,173	\$ -	\$ 4,550,173	\$ 3,815,559	\$ (734,614)	\$ 3,815,559	\$ 4,014,514

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
05535DCF9	\$ 3,454,425	\$ -	\$ 3,454,425	\$ 3,141,048	\$ (313,377)	\$ 3,141,048	\$ 3,134,409
07384YPP5	321,829	-	321,829	148,884	(172,945)	148,884	132,968
07386HCP4	2,164	-	2,164	(6,255)	(8,418)	(6,255)	320
76110H4M8	1,715	-	1,715	(3,719)	(5,434)	(3,719)	641
79548KXQ6	423,086	-	423,086	383,222	(39,864)	383,222	292,015
939336Z48	117,607	-	117,607	-	(117,607)	-	126,945
Totals	\$ 4,320,826	\$ -	\$ 4,320,826	\$ 3,663,181	\$ (657,645)	\$ 3,663,181	\$ 3,687,297

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
59020UW43	\$ 337,732	\$ -	\$ 337,732	\$ 271,686	\$ (66,046)	\$ 271,686	\$ 354,508
76110H4M8	6,848	-	6,848	1,969	(4,879)	1,969	1,713
863579DV7	289,655	-	289,655	5,567	(284,089)	5,567	30,531
Totals	\$ 634,235	\$ -	\$ 634,235	\$ 279,221	\$ (355,014)	\$ 279,221	\$ 386,752

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2018:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
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07386HEN7	\$	43,711	\$	-	\$	43,711	\$	2,334	\$	(41,377)	\$	2,334	\$	1,609
79548KXQ6		520,764		-		520,764		476,293		(44,471)		476,293		365,994
45660NZY4		81,215		-		81,215		9,554		(71,661)		9,554		80,891
Totals	\$	645,690	\$	-	\$	645,690	\$	488,181	\$	(157,509)	\$	488,181	\$	448,494

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

The following is the impairment listing for loan-backed and structured securities for the three months ended December 31, 2017:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
03927RAA2	\$ 2,886,563	\$ -	\$ 2,886,563	\$ 1,464,907	\$ (1,421,656)	\$ 1,464,907	\$ 1,481,241
03927RAB0	910,639	-	910,639	363,543	(547,096)	363,543	362,176
07386HCP4	7,995	-	7,995	1,386	(6,609)	1,386	2,673
12669GMS7	25,101	-	25,101	21,923	(3,177)	21,923	21,921
22541QOR6	21,202	-	21,202	12,504	(8,698)	12,504	16,106
2254W0NK7	97,695	-	97,695	94,495	(3,200)	94,495	139,833
86359ACG6	318	-	318	-	(318)	-	2
Totals	\$ 3,949,513	\$ -	\$ 3,949,513	\$ 1,958,759	\$ (1,990,754)	\$ 1,958,759	\$ 2,023,952

The following is the impairment listing for loan-backed and structured securities for the three months ended September 30, 2017:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
22541NMA4	\$ 42,273	\$ -	\$ 42,273	\$ 41,434	\$ (839)	\$ 41,434	\$ 41,095
22541NMB2	11,869	-	11,869	11,634	(234)	11,634	11,535
22541SSD1	12,232	-	12,232	20	(12,213)	20	5,978
52108MDP5	3,497,947	-	3,497,947	-	(3,497,947)	-	1,925,413
55274SAM3	167,196	-	167,196	153,991	(13,206)	153,991	179,429
76110W4J2	1,131	-	1,131	229	(902)	229	556
88157QAL2	686,945	-	686,945	660,921	(26,024)	660,921	2,125,943
89789KAC9	16,949	-	16,949	8,714	(8,235)	8,714	357,735
Totals	\$ 4,436,542	\$ -	\$ 4,436,542	\$ 876,942	\$ (3,559,600)	\$ 876,942	\$ 4,647,683

The following is the impairment listing for loan-backed and structured securities for the three months ended June 30, 2017:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
76110H4M8	\$ 4,413	\$ -	\$ 4,413	\$ 2,326	\$ (2,087)	\$ 2,326	\$ 4,073
86358RLG0	3,485	-	3,485	2,670	(815)	2,670	30,171
86359ACG6	16,324	-	16,324	2	(16,322)	2	2
88157QAL2	774,182	-	774,182	675,599	(98,583)	675,599	1,947,675
89789KAC9	17,294	-	17,294	8,920	(8,374)	8,920	356,047
77277LAF4	22,514,590	-	22,514,590	22,167,493	(347,097)	22,167,493	34,318,674
77277LAH0	1,135,088	-	1,135,088	1,118,159	(16,929)	1,118,159	2,738,435
77277LAJ6	16,073,175	-	16,073,175	15,833,787	(239,388)	15,833,787	21,595,653
Totals	\$ 40,538,551	\$ -	\$ 40,538,551	\$ 39,808,956	\$ (729,595)	\$ 39,808,956	\$ 60,990,732

The following is the impairment listing for loan-backed and structured securities for the three months ended March 31, 2017:

CUSIP	Amortized Cost before Cumulative Adjustment	Cumulative Adjustment	Amortized Cost before OTTI	Projected Cash Flow	Recognized OTTI	Amortized Cost after OTTI	Fair Value
17307GH76	\$ 274,894	\$ -	\$ 274,894	\$ 44,730	\$ (230,163)	\$ 44,730	\$ 152,777
22541QJR4	11,175	-	11,175	54	(11,122)	54	6,866
32051DCK6	182,177	-	182,177	160,728	(21,449)	160,728	179,180
55274SAM3	225,790	-	225,790	209,839	(15,951)	209,839	218,832
86358RA23	1,326,199	-	1,326,199	1,253,636	(72,563)	1,253,636	1,289,099
86359ACG6	6,287	-	6,287	49	(6,239)	49	2

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
NOTES TO STATUTORY FINANCIAL STATEMENTS, continued

US77277LAF40	22,537,014	-	22,537,014	22,514,590	(22,424)	22,514,590	31,699,907
US77277LAH06	1,136,182	-	1,136,182	1,135,088	(1,094)	1,135,088	2,662,526
US77277LAJ61	16,088,661	-	16,088,661	16,073,175	(15,486)	16,073,175	19,947,746
Totals	\$ 41,788,380	\$ -	\$ 41,788,380	\$ 41,391,889	\$ (396,491)	\$ 41,391,889	\$ 56,156,936



KPMG LLP
Two Financial Center
60 South Street
Boston, MA 02111

Report of Independent Registered Public Accounting Firm

The Board of Directors of Massachusetts Mutual Life Insurance Company and Contract Owners of Massachusetts Mutual Variable Annuity Separate Account 4:

Opinion on the Financial Statements

We have audited the accompanying statements of assets and liabilities of the sub-accounts listed in Appendix A that comprise Massachusetts Mutual Variable Annuity Separate Account 4 (Separate Account), as of December 31, 2023, the related statements of operations and changes in net assets for each of the years in the two-year period then ended (or for the periods indicated in Appendix A), and the related notes, including the financial highlights in Note 8, for each of the years or periods in the five-year period then ended (collectively, the financial statements). In our opinion, the financial statements present fairly, in all material respects, the financial position of each sub-account as of December 31, 2023, and the results of their operations and the changes in their net assets for each of the years in the two-year period then ended (or for the periods indicated in Appendix A), and the financial highlights for each of the years or periods in the five-year period then ended, in conformity with U.S. generally accepted accounting principles.

Basis for Opinion

These financial statements are the responsibility of the Separate Account's management. Our responsibility is to express an opinion on these financial statements based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Separate Account in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement, whether due to error or fraud. Our audits included performing procedures to assess the risks of material misstatement of the financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the financial statements. Such procedures also included confirmation of securities owned as of December 31, 2023, by correspondence with the underlying mutual funds or their transfer agent. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the financial statements. We believe that our audits provide a reasonable basis for our opinion.

/s/ KPMG LLP

We have served as the Separate Account's auditor since 2004.

Boston, Massachusetts
March 7, 2024

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KPMG LLP, a Delaware limited liability partnership and a member firm of the KPMG global organization of independent member firms affiliated with KPMG International Limited, a private English company limited by guarantee.

Appendix A

Massachusetts Mutual Variable Annuity Separate Account 4 was comprised of the following sub-accounts. Statements of assets and liabilities as of December 31, 2023, and statements of operations and changes in net assets for each of the years in the two-year period ended December 31, 2023 unless otherwise noted.

Sub-Accounts

BlackRock 60/40 Target Allocation ETF V.I. Sub-Account (Class III)
Cboe Vest U.S. Large Cap 10% Buffer Strategies V.I. Sub-Account*
Delaware Ivy VIP Asset Strategy Sub-Account (Class II)
Fidelity® VIP Contrafund® Sub-Account (Initial Class)
Fidelity® VIP Contrafund® Sub-Account (Service Class 2)
Fidelity® VIP Health Care Sub-Account**
Fidelity® VIP Overseas Sub-Account (Service Class 2)*
Fidelity® VIP Real Estate Sub-Account**
Fidelity® VIP Strategic Income Sub-Account**
Invesco Oppenheimer V.I. International Growth Sub-Account (Series I)
Invesco Oppenheimer V.I. International Growth Sub-Account (Series II)
Invesco V.I. Capital Appreciation Sub-Account (Series I)
Invesco V.I. Capital Appreciation Sub-Account (Series II)
Invesco V.I. Conservative Balanced Sub-Account (Series I)
Invesco V.I. Conservative Balanced Sub-Account (Series II)
Invesco V.I. Core Plus Bond Sub-Account
Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series I)
Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series II)
Invesco V.I. Diversified Dividend Sub-Account (Series I)
Invesco V.I. Diversified Dividend Sub-Account (Series II)
Invesco V.I. Global Sub-Account (Series I)
Invesco V.I. Global Sub-Account (Series II)
Invesco V.I. Global Strategic Income Sub-Account (Series I)
Invesco V.I. Global Strategic Income Sub-Account (Series II)
Invesco V.I. Health Care Sub-Account (Series I)
Invesco V.I. Health Care Sub-Account (Series II)
Invesco V.I. Main Street Sub-Account (Series I)
Invesco V.I. Main Street Sub-Account (Series II)
Invesco V.I. Technology Sub-Account (Series I)
Invesco V.I. Technology Sub-Account (Series II)
Invesco V.I. U.S. Government Money Sub-Account

Janus Henderson Global Technology and Innovation Sub-Account**
MML Aggressive Allocation Sub-Account (Initial Class)
MML Aggressive Allocation Sub-Account (Service Class)
MML American Funds Core Allocation Sub-Account
MML American Funds Growth Sub-Account
MML Balanced Allocation Sub-Account (Initial Class)
MML Balanced Allocation Sub-Account (Service Class)
MML Blend Sub-Account (Initial Class)
MML Blend Sub-Account (Service Class)
MML Blue Chip Growth Sub-Account (Initial Class)
MML Blue Chip Growth Sub-Account (Service Class)
MML Conservative Allocation Sub-Account (Initial Class)
MML Conservative Allocation Sub-Account (Service Class)
MML Dynamic Bond Sub-Account (Service Class I)
MML Equity Sub-Account (Initial Class)
MML Equity Sub-Account (Service Class)
MML Equity Income Sub-Account (Initial Class)
MML Equity Income Sub-Account (Service Class)
MML Equity Index Sub-Account (Class I)
MML Equity Index Sub-Account (Service Class I)
MML Equity Rotation Sub-Account (Service Class I)
MML Focused Equity Sub-Account
MML Foreign Sub-Account (Initial Class)
MML Foreign Sub-Account (Service Class)
MML Fundamental Equity Sub-Account
MML Fundamental Value Sub-Account
MML Global Sub-Account (Class I)
MML Global Sub-Account (Class II)
MML Global Sub-Account (Service Class I)
MML Growth Allocation Sub-Account (Initial Class)
MML Growth Allocation Sub-Account (Service Class)
MML High Yield Sub-Account
MML Income & Growth Sub-Account (Initial Class)
MML Income & Growth Sub-Account (Service Class)
MML Inflation-Protected and Income Sub-Account (Initial Class)
MML Inflation-Protected and Income Sub-Account (Service Class)
MML International Equity Sub-Account
MML iShares® 60/40 Allocation Sub-Account**
MML iShares® 80/20 Allocation Sub-Account**
MML Large Cap Growth Sub-Account (Initial Class)
MML Large Cap Growth Sub-Account (Service Class)

MML Managed Bond Sub-Account (Initial Class)
 MML Managed Bond Sub-Account (Service Class)
 MML Managed Volatility Sub-Account (Initial Class)
 MML Managed Volatility Sub-Account (Service Class)
 MML Mid Cap Growth Sub-Account (Initial Class)
 MML Mid Cap Growth Sub-Account (Service Class)
 MML Mid Cap Value Sub-Account (Initial Class)
 MML Mid Cap Value Sub-Account (Service Class)
 MML Moderate Allocation Sub-Account (Initial Class)
 MML Moderate Allocation Sub-Account (Service Class)
 MML Short-Duration Bond Sub-Account
 MML Small Cap Equity Sub-Account (Initial Class)
 MML Small Cap Equity Sub-Account (Service Class)
 MML Small Cap Growth Equity Sub-Account (Initial Class)
 MML Small Cap Growth Equity Sub-Account (Service Class)

MML Small Company Value Sub-Account
 MML Small/Mid Cap Value Sub-Account (Initial Class)
 MML Small/Mid Cap Value Sub-Account (Service Class)
 MML Strategic Emerging Markets Sub-Account (Service Class I)
 MML Sustainable Equity Sub-Account (Initial Class)
 MML Sustainable Equity Sub-Account (Service Class)
 MML Total Return Bond Sub-Account
 MML U.S. Government Money Market Sub-Account
 PIMCO CommodityRealReturn® Strategy Sub-Account
 PIMCO Income Sub-Account**
 VY® CBRE Global Real Estate Sub-Account

* Statements of operations and changes in net assets for the period from May 1, 2023 to December 31, 2023.

** Statements of operations and changes in net assets for the year ended December 31, 2023 and the period from February 28, 2022 to December 31, 2022.

Other periods presented:

MML Equity Momentum Sub-Account (Service Class I) and MML Special Situations Sub-Account: Financial highlights for each of the years in the three-year period ended December 31, 2021.

Oppenheimer Global Multi-Alternatives Sub-Account: Financial highlights for the year ended December 31, 2019.

MML American Funds International Sub-Account: Statements of operations and changes in net assets for the period from January 1, 2022 to November 22, 2022 (the date of liquidation) and the financial highlights for the period from January 1, 2022 to November 22, 2022 and each of the years in the three-year period ended December 31, 2021.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES

December 31, 2023

	BlackRock 60/40 Target Allocation ETF V.I. Sub-Account (Class III)	Cboe Vest U.S. Large Cap 10% Buffer Strategies V.I. Sub-Account	Delaware Ivy VIP Asset Strategy Sub-Account (Class II)	Fidelity® VIP Contrafund® Sub-Account (Initial Class)	Fidelity® VIP Contrafund® Sub-Account (Service Class 2)	Fidelity® VIP Health Care Sub-Account	Fidelity® VIP Overseas Sub-Account (Service Class 2)	Fidelity® VIP Real Estate Sub-Account
ASSETS								
Investments								
Number of shares	1,431,444	21,377	1,265,876	3,854,056	4,940,992	31,496	6,037	31,479
Identified cost	\$ 18,851,291	\$ 458,493	\$ 11,551,681	\$ 150,285,419	\$ 193,878,448	\$ 1,027,547	\$ 144,645	\$ 524,978
Value	\$ 18,823,486	\$ 488,039	\$ 11,089,071	\$ 187,422,752	\$ 231,386,669	\$ 1,069,597	\$ 154,002	\$ 531,372
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	159	-	-	-	-
Total assets	18,823,486	488,039	11,089,071	187,422,911	231,386,669	1,069,597	154,002	531,372
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	-	-	-	11,241	-	-	-	-
Payable to Massachusetts Mutual Life Insurance Company	-	-	21	-	5	-	6	-
Total liabilities	-	-	21	11,241	5	-	6	-
NET ASSETS	\$ 18,823,486	\$ 488,039	\$ 11,089,050	\$ 187,411,670	\$ 231,386,664	\$ 1,069,597	\$ 153,996	\$ 531,372
Net Assets:								
Accumulation units - value	\$ 18,823,486	\$ 488,039	\$ 11,089,050	\$ 180,526,304	\$ 231,382,547	\$ 1,069,597	\$ 153,996	\$ 531,372
Contracts in payout (annuitization) period	-	-	-	6,885,366	4,117	-	-	-
Net assets	\$ 18,823,486	\$ 488,039	\$ 11,089,050	\$ 187,411,670	\$ 231,386,664	\$ 1,069,597	\$ 153,996	\$ 531,372
Outstanding units								
Contract owners	1,201,079	44,048	760,284	3,269,827	8,181,542	101,885	14,620	58,941
UNIT VALUE								
Panorama Premier	\$ -	\$ -	\$ -	\$ 76.31	\$ -	\$ -	\$ -	\$ -
Panorama Passage®								
Tier 1	-	-	-	56.93	-	-	-	-
Tier 2	-	-	-	55.08	-	-	-	-
Tier 3	-	-	-	60.49	-	-	-	-
Tier 4	-	-	-	57.32	-	-	-	-
MassMutual Artistry	-	-	-	52.15	-	-	-	-
MassMutual Transitions®								
Custom Plan	-	-	-	66.62	-	-	-	-
Package Plan I	-	-	-	66.62	-	-	-	-
Package Plan II	-	-	-	61.77	-	-	-	-
Package Plan III	-	-	-	58.52	-	-	-	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)

December 31, 2023

	BlackRock 60/40 Target Allocation ETF V.I. Sub-Account (Class III)	Cboe Vest U.S. Large Cap 10% Buffer Strategies V.I. Sub-Account	Delaware Ivy VIP Asset Strategy Sub-Account (Class II)	Fidelity® VIP Contrafund® Sub-Account (Initial Class)	Fidelity® VIP Contrafund® Sub-Account (Service Class 2)	Fidelity® VIP Health Care Sub-Account	Fidelity® VIP Overseas Sub-Account (Service Class 2)	Fidelity® VIP Real Estate Sub-Account
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	-	-	15.57	50.84	-	-	-	-
Tier 2	-	-	14.89	46.97	-	-	-	-
Tier 3	-	-	14.48	44.69	-	-	-	-
Tier 4	-	-	14.89	46.89	-	-	-	-
Tier 5	-	-	14.24	43.32	-	-	-	-
Tier 6	-	-	13.84	41.22	-	-	-	-
Tier 7	-	-	14.72	46.16	-	-	-	-
Tier 8	-	-	14.08	42.57	-	-	-	-
Tier 9	-	-	14.40	-	43.09	-	-	-
Tier 10	-	-	15.22	-	47.46	-	-	-
Tier 11	-	-	13.77	-	39.74	-	-	-
Tier 12	-	-	14.56	-	44.64	-	-	-
Tier 13	-	-	13.09	-	37.37	-	-	-
Tier 14	-	-	13.69	-	40.52	-	-	-
MassMutual RetireEase Select SM								
Tier 1	-	-	-	33.31	-	-	-	-
Tier 2	-	-	-	36.19	-	-	-	-
MassMutual Transitions Select SM								
Tier 1	-	-	16.28	58.67	-	-	-	-
Tier 2	-	-	16.28	-	56.46	-	-	-
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	-	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	-	-	14.06	-	23.35	-	-	-
Tier 2	-	-	13.66	-	22.69	-	-	-
Tier 3	-	-	14.06	-	23.35	-	-	-
MassMutual Capital Vantage SM								
Tier 1	15.25	-	14.00	-	23.25	-	-	-
Tier 2	15.69	-	14.41	-	23.92	-	-	-
Tier 3	14.69	-	13.50	-	22.41	-	-	-
Tier 4	15.25	-	14.00	-	23.25	-	-	-
Tier 5	15.12	-	13.89	-	23.06	-	-	-
Tier 6	15.69	-	14.41	-	23.92	-	-	-
MassMutual Envision VA	-	11.08	10.07	-	11.13	10.50	10.53	9.02

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	Fidelity® VIP Strategic Income Sub-Account	Invesco Oppenheimer V.I. International Growth Sub-Account (Series I)	Invesco Oppenheimer V.I. International Growth Sub-Account (Series II)	Invesco V.I. Capital Appreciation Sub-Account (Series I)	Invesco V.I. Capital Appreciation Sub-Account (Series II)	Invesco V.I. Conservative Balanced Sub-Account (Series I)	Invesco V.I. Conservative Balanced Sub-Account (Series II)	Invesco V.I. Core Plus Bond Sub-Account
ASSETS								
Investments								
Number of shares	67,512	10,502,224	9,501,658	2,472,361	194,919	350,507	897	234,227
Identified cost	\$ 692,860	\$ 22,689,349	\$ 21,213,206	\$ 117,831,831	\$ 8,977,819	\$ 4,965,880	\$ 13,788	\$ 1,547,668
Value	\$ 698,753	\$ 21,214,493	\$ 20,333,547	\$ 116,374,018	\$ 8,701,167	\$ 5,383,783	\$ 13,538	\$ 1,344,464
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	-	-	-	-	-
Total assets	698,753	21,214,493	20,333,547	116,374,018	8,701,167	5,383,783	13,538	1,344,464
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	-	301	-	6,220	-	1,105	-	10
Payable to Massachusetts Mutual Life Insurance Company	-	156	21	511	14	100	6	-
Total liabilities	-	457	21	6,731	14	1,205	6	10
NET ASSETS	\$ 698,753	\$ 21,214,036	\$ 20,333,526	\$ 116,367,287	\$ 8,701,153	\$ 5,382,578	\$ 13,532	\$ 1,344,454
Net Assets:								
Accumulation units - value	\$ 698,753	\$ 20,402,825	\$ 20,333,526	\$ 112,912,950	\$ 8,701,153	\$ 5,345,751	\$ 13,532	\$ 1,344,121
Contracts in payout (annuitization) period	-	811,211	-	3,454,337	-	36,827	-	333
Net assets	\$ 698,753	\$ 21,214,036	\$ 20,333,526	\$ 116,367,287	\$ 8,701,153	\$ 5,382,578	\$ 13,532	\$ 1,344,454
Outstanding units								
Contract owners	71,420	740,991	1,072,463	2,847,791	223,386	287,172	797	94,073
UNIT VALUE								
Panorama Premier	\$ -	\$ 40.98	\$ -	\$ 39.30	\$ -	\$ 18.02	\$ -	\$ 14.29
Panorama Passage®								
Tier 1	-	26.26	-	39.15	-	17.64	-	-
Tier 2	-	25.41	-	37.88	-	17.07	-	-
Tier 3	-	27.91	-	41.59	-	18.72	-	-
Tier 4	-	26.45	-	39.42	-	17.74	-	-
MassMutual Artistry	-	19.80	-	29.14	-	18.39	-	-
MassMutual Transitions®								
Custom Plan	-	32.39	-	44.88	-	20.28	-	-
Package Plan I	-	32.39	-	44.88	-	20.28	-	-
Package Plan II	-	30.03	-	41.61	-	18.80	-	-
Package Plan III	-	28.46	-	39.43	-	17.81	-	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)

December 31, 2023

	Fidelity® VIP Strategic Income Sub-Account	Invesco Oppenheimer V.I. International Growth Sub-Account (Series I)	Invesco Oppenheimer V.I. International Growth Sub-Account (Series II)	Invesco V.I. Capital Appreciation Sub-Account (Series I)	Invesco V.I. Capital Appreciation Sub-Account (Series II)	Invesco V.I. Conservative Balanced Sub-Account (Series I)	Invesco V.I. Conservative Balanced Sub-Account (Series II)	Invesco V.I. Core Plus Bond Sub-Account
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	-	26.21	-	37.03	-	15.49	-	-
Tier 2	-	24.21	-	34.21	-	14.31	-	-
Tier 3	-	23.04	-	32.56	-	13.61	-	-
Tier 4	-	24.17	-	34.16	-	14.28	-	-
Tier 5	-	22.33	-	31.55	-	13.19	-	-
Tier 6	-	21.25	-	30.03	-	12.56	-	-
Tier 7	-	23.79	-	33.62	-	14.06	-	-
Tier 8	-	21.94	-	31.01	-	12.97	-	-
Tier 9	-	-	22.22	-	31.38	-	13.12	-
Tier 10	-	-	24.47	-	34.56	-	14.45	-
Tier 11	-	-	20.49	-	28.94	-	12.10	-
Tier 12	-	-	23.02	-	32.51	-	13.60	-
Tier 13	-	-	19.27	-	27.21	-	-	-
Tier 14	-	-	20.89	-	29.51	-	-	-
MassMutual RetireEase Select SM								
Tier 1	-	14.29	-	29.71	-	12.10	-	-
Tier 2	-	15.52	-	32.28	-	13.15	-	-
MassMutual Transitions Select SM								
Tier 1	-	31.58	-	43.50	-	17.65	-	-
Tier 2	-	-	30.41	-	41.86	-	16.98	-
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	-	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	-	-	13.11	-	-	-	-	-
Tier 2	-	-	12.74	-	-	-	-	-
Tier 3	-	-	13.11	-	-	-	-	-
MassMutual Capital Vantage SM								
Tier 1	-	-	13.05	-	-	-	-	-
Tier 2	-	-	13.43	-	-	-	-	-
Tier 3	-	-	12.58	-	-	-	-	-
Tier 4	-	-	13.05	-	-	-	-	-
Tier 5	-	-	12.95	-	-	-	-	-
Tier 6	-	-	13.43	-	-	-	-	-
MassMutual Envision VA	9.78	-	10.17	-	-	-	-	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series I)	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series II)	Invesco V.I. Diversified Dividend Sub-Account (Series I)	Invesco V.I. Diversified Dividend Sub-Account (Series II)	Invesco V.I. Global Sub-Account (Series I)	Invesco V.I. Global Sub-Account (Series II)	Invesco V.I. Global Strategic Income Sub-Account (Series I)	Invesco V.I. Global Strategic Income Sub-Account (Series II)
ASSETS								
Investments								
Number of shares	1,154,235	456,124	182,544	356,296	3,476,834	1,636,495	23,072,563	9,453,530
Identified cost	\$ 85,002,683	\$ 31,665,194	\$ 4,619,375	\$ 8,944,648	\$ 130,572,378	\$ 60,960,613	\$ 108,650,908	\$ 45,965,937
Value	\$ 72,497,476	\$ 24,635,268	\$ 4,424,876	\$ 8,547,529	\$ 127,113,050	\$ 58,095,558	\$ 98,981,294	\$ 41,784,604
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	-	-	-	-	-
Total assets	72,497,476	24,635,268	4,424,876	8,547,529	127,113,050	58,095,558	98,981,294	41,784,604
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	4,714	-	-	-	6,435	-	7,569	-
Payable to Massachusetts Mutual Life Insurance Company	273	9	78	11	295	21	284	15
Total liabilities	4,987	9	78	11	6,730	21	7,853	15
NET ASSETS	\$ 72,492,489	\$ 24,635,259	\$ 4,424,798	\$ 8,547,518	\$ 127,106,320	\$ 58,095,537	\$ 98,973,441	\$ 41,784,589
Net Assets:								
Accumulation units - value	\$ 69,849,845	\$ 24,633,617	\$ 4,299,143	\$ 8,547,518	\$ 123,387,861	\$ 58,091,380	\$ 95,961,186	\$ 41,784,589
Contracts in payout (annuitization) period	2,642,644	1,642	125,655	-	3,718,459	4,157	3,012,255	-
Net assets	\$ 72,492,489	\$ 24,635,259	\$ 4,424,798	\$ 8,547,518	\$ 127,106,320	\$ 58,095,537	\$ 98,973,441	\$ 41,784,589
Outstanding units								
Contract owners	2,017,336	1,137,821	282,594	610,808	2,990,290	2,263,619	6,098,483	3,221,166
UNIT VALUE								
Panorama Premier	\$ 29.56	\$ -	\$ 17.31	\$ -	\$ 52.68	\$ -	\$ 20.53	\$ -
Panorama Passage®								
Tier 1	29.03	-	16.95	-	51.73	-	19.99	-
Tier 2	28.08	-	16.40	-	50.05	-	19.34	-
Tier 3	30.84	-	17.98	-	54.96	-	21.24	-
Tier 4	29.23	-	17.04	-	52.09	-	20.13	-
MassMutual Artistry	16.53	-	15.86	-	36.84	-	20.62	-
MassMutual Transitions®								
Custom Plan	42.42	-	17.09	-	48.24	-	20.49	-
Package Plan I	42.42	-	17.09	-	48.24	-	20.49	-
Package Plan II	39.33	-	15.85	-	44.73	-	19.00	-
Package Plan III	37.26	-	15.01	-	42.38	-	18.00	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series I)	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series II)	Invesco V.I. Diversified Dividend Sub-Account (Series I)	Invesco V.I. Diversified Dividend Sub-Account (Series II)	Invesco V.I. Global Sub-Account (Series I)	Invesco V.I. Global Sub-Account (Series II)	Invesco V.I. Global Strategic Income Sub-Account (Series I)	Invesco V.I. Global Strategic Income Sub-Account (Series II)
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	35.81	-	13.15	-	36.50	-	14.86	-
Tier 2	33.08	-	12.15	-	33.72	-	13.73	-
Tier 3	31.48	-	11.56	-	32.09	-	13.07	-
Tier 4	33.03	-	12.13	-	33.66	-	13.71	-
Tier 5	30.51	-	11.21	-	31.10	-	12.66	-
Tier 6	29.03	-	10.66	-	29.59	-	12.05	-
Tier 7	32.51	-	11.94	-	33.14	-	13.49	-
Tier 8	29.98	-	11.01	-	30.56	-	12.45	-
Tier 9	-	30.32	-	11.17	-	30.94	-	12.58
Tier 10	-	33.40	-	12.30	-	34.08	-	13.86
Tier 11	-	27.96	-	10.30	-	28.53	-	11.60
Tier 12	-	31.41	-	11.57	-	32.05	-	13.04
Tier 13	-	26.30	-	9.69	-	26.83	-	10.91
Tier 14	-	28.51	-	10.50	-	29.09	-	11.83
MassMutual RetireEase Select SM								
Tier 1	25.98	-	10.28	-	22.68	-	12.18	-
Tier 2	28.23	-	11.17	-	24.64	-	13.24	-
MassMutual Transitions Select SM								
Tier 1	41.67	-	15.57	-	43.90	-	16.02	-
Tier 2	-	40.07	-	15.02	-	42.26	-	15.41
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	-	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	-	19.91	-	-	-	18.22	-	9.93
Tier 2	-	19.35	-	-	-	17.70	-	9.65
Tier 3	-	19.91	-	-	-	18.22	-	9.93
MassMutual Capital Vantage SM								
Tier 1	-	19.83	-	-	-	18.14	-	9.89
Tier 2	-	20.40	-	-	-	18.67	-	10.18
Tier 3	-	19.11	-	-	-	17.49	-	9.53
Tier 4	-	19.83	-	-	-	18.14	-	9.89
Tier 5	-	19.67	-	-	-	18.00	-	9.81
Tier 6	-	20.40	-	-	-	18.67	-	10.18
MassMutual Envision VA	-	-	-	9.38	-	10.76	-	9.63

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	Invesco V.I. Health Care Sub-Account (Series I)	Invesco V.I. Health Care Sub-Account (Series II)	Invesco V.I. Main Street Sub-Account (Series I)	Invesco V.I. Main Street Sub-Account (Series II)	Invesco V.I. Technology Sub-Account (Series I)	Invesco V.I. Technology Sub-Account (Series II)	Invesco V.I. U.S. Government Money Sub-Account	Janus Henderson Global Technology and Innovation Sub-Account
ASSETS								
Investments								
Number of shares	319,569	313,086	1,618,608	1,141,907	422,339	524,777	5,993,170	43,826
Identified cost	\$ 8,846,835	\$ 8,142,205	\$ 34,954,054	\$ 24,000,714	\$ 8,689,163	\$ 9,692,760	\$ 5,993,170	\$ 574,601
Value	\$ 8,280,032	\$ 7,445,183	\$ 29,491,035	\$ 20,291,691	\$ 7,813,274	\$ 8,322,967	\$ 5,993,169	\$ 703,850
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	1	-	-	-	-	-	-
Total assets	8,280,032	7,445,184	29,491,035	20,291,691	7,813,274	8,322,967	5,993,169	703,850
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	703	-	1,911	-	1,293	-	2,592	-
Payable to Massachusetts Mutual Life Insurance Company	112	-	147	18	107	-	76	-
Total liabilities	815	-	2,058	18	1,400	-	2,668	-
NET ASSETS	\$ 8,279,217	\$ 7,445,184	\$ 29,488,977	\$ 20,291,673	\$ 7,811,874	\$ 8,322,967	\$ 5,990,501	\$ 703,850
Net Assets:								
Accumulation units - value	\$ 7,922,242	\$ 7,445,184	\$ 29,202,505	\$ 20,291,673	\$ 7,590,234	\$ 8,321,135	\$ 5,896,929	\$ 703,850
Contracts in payout (annuitization) period	356,975	-	286,472	-	221,640	1,832	93,572	-
Net assets	\$ 8,279,217	\$ 7,445,184	\$ 29,488,977	\$ 20,291,673	\$ 7,811,874	\$ 8,322,967	\$ 5,990,501	\$ 703,850
Outstanding units								
Contract owners	237,830	221,061	778,371	881,293	341,037	181,352	559,667	61,103
UNIT VALUE								
Panorama Premier	\$ 34.80	\$ -	\$ 33.10	\$ -	\$ 11.50	\$ -	\$ 12.04	\$ -
Panorama Passage®								
Tier 1	34.07	-	33.53	-	11.25	-	10.30	-
Tier 2	32.96	-	32.44	-	10.89	-	9.97	-
Tier 3	36.14	-	35.62	-	11.94	-	10.94	-
Tier 4	34.25	-	33.76	-	11.32	-	10.37	-
MassMutual Artistry	31.61	-	31.11	-	11.40	-	10.67	-
MassMutual Transitions®								
Custom Plan	39.40	-	43.45	-	45.06	-	10.71	-
Package Plan I	39.40	-	43.45	-	45.06	-	10.71	-
Package Plan II	36.53	-	40.29	-	41.78	-	9.93	-
Package Plan III	34.61	-	38.17	-	39.58	-	9.41	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	Invesco V.I. Health Care Sub-Account (Series I)	Invesco V.I. Health Care Sub-Account (Series II)	Invesco V.I. Main Street Sub-Account (Series I)	Invesco V.I. Main Street Sub-Account (Series II)	Invesco V.I. Technology Sub-Account (Series I)	Invesco V.I. Technology Sub-Account (Series II)	Invesco V.I. U.S. Government Money Sub-Account	Janus Henderson Global Technology and Innovation Sub-Account
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	31.20	-	35.85	-	39.95	-	9.48	-
Tier 2	28.82	-	33.11	-	36.90	-	8.76	-
Tier 3	27.42	-	31.51	-	35.12	-	8.34	-
Tier 4	28.77	-	33.06	-	36.84	-	8.74	-
Tier 5	26.58	-	30.54	-	34.03	-	8.08	-
Tier 6	25.29	-	29.06	-	32.39	-	7.69	-
Tier 7	28.32	-	32.54	-	36.27	-	8.61	-
Tier 8	26.12	-	30.01	-	33.45	-	7.94	-
Tier 9	-	26.45	-	30.37	-	33.86	-	-
Tier 10	-	29.13	-	33.45	-	37.29	-	-
Tier 11	-	24.39	-	28.01	-	31.22	-	-
Tier 12	-	27.40	-	31.47	-	35.08	-	-
Tier 13	-	22.94	-	26.34	-	29.36	-	-
Tier 14	-	24.87	-	28.56	-	31.84	-	-
MassMutual RetireEase Select SM								
Tier 1	25.41	-	26.49	-	34.43	-	-	-
Tier 2	27.60	-	28.78	-	37.41	-	-	-
MassMutual Transitions Select SM								
Tier 1	37.22	-	41.76	-	54.01	-	10.29	-
Tier 2	-	35.84	-	40.18	-	51.98	-	-
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	-	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	-	-	-	19.89	-	-	-	-
Tier 2	-	-	-	19.33	-	-	-	-
Tier 3	-	-	-	19.89	-	-	-	-
MassMutual Capital Vantage SM								
Tier 1	-	-	-	19.80	-	-	-	-
Tier 2	-	-	-	20.38	-	-	-	-
Tier 3	-	-	-	19.09	-	-	-	-
Tier 4	-	-	-	19.80	-	-	-	-
Tier 5	-	-	-	19.64	-	-	-	-
Tier 6	-	-	-	20.38	-	-	-	-
MassMutual Envision VA	-	-	-	-	-	-	-	11.52

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)

December 31, 2023

	MML Aggressive Allocation Sub-Account (Initial Class)	MML Aggressive Allocation Sub-Account (Service Class)	MML American Funds Core Allocation Sub-Account	MML American Funds Growth Sub-Account	MML Balanced Allocation Sub-Account (Initial Class)	MML Balanced Allocation Sub-Account (Service Class)	MML Blend Sub-Account (Initial Class)	MML Blend Sub-Account (Service Class)
ASSETS								
Investments								
Number of shares	3,196,294	8,681,774	65,448,686	16,828,953	6,623,132	31,055,790	2,611,987	9,721,555
Identified cost	\$ 30,206,672	\$ 79,469,075	\$ 733,431,836	\$ 248,649,660	\$ 62,572,725	\$ 287,995,897	\$ 55,292,947	\$ 203,672,001
Value	\$ 26,625,130	\$ 70,496,002	\$ 658,413,776	\$ 234,932,185	\$ 54,442,143	\$ 252,483,577	\$ 50,812,847	\$ 187,651,148
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	-	-	-	-	-
Total assets	26,625,130	70,496,002	658,413,776	234,932,185	54,442,143	252,483,577	50,812,847	187,651,148
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	-	-	-	-	-	-	314	-
Payable to Massachusetts Mutual Life Insurance Company	40	22	82	39	64	11	56	13
Total liabilities	40	22	82	39	64	11	370	13
NET ASSETS	\$ 26,625,090	\$ 70,495,980	\$ 658,413,694	\$ 234,932,146	\$ 54,442,079	\$ 252,483,566	\$ 50,812,477	\$ 187,651,135
Net Assets:								
Accumulation units - value	\$ 26,625,090	\$ 70,495,980	\$ 658,069,402	\$ 234,734,056	\$ 54,442,079	\$ 252,372,531	\$ 49,570,542	\$ 187,651,135
Contracts in payout (annuitization) period	-	-	344,292	198,090	-	111,035	1,241,935	-
Net assets	\$ 26,625,090	\$ 70,495,980	\$ 658,413,694	\$ 234,932,146	\$ 54,442,079	\$ 252,483,566	\$ 50,812,477	\$ 187,651,135
Outstanding units								
Contract owners	1,027,797	3,406,635	33,354,597	7,531,821	2,873,841	15,847,072	1,626,991	10,381,369
UNIT VALUE								
Panorama Premier	\$ 25.11	\$ -	\$ -	\$ -	\$ 18.67	\$ -	\$ 27.35	\$ -
Panorama Passage®								
Tier 1	24.76	-	-	-	18.40	-	28.82	-
Tier 2	24.13	-	-	-	17.94	-	27.89	-
Tier 3	25.76	-	-	-	19.15	-	30.62	-
Tier 4	24.72	-	-	-	18.37	-	29.02	-
MassMutual Artistry	26.01	-	27.72	68.55	19.33	-	30.41	-
MassMutual Transitions®								
Custom Plan	26.98	-	-	-	20.06	-	36.34	-
Package Plan I	26.98	-	-	-	20.06	-	36.34	-
Package Plan II	25.52	-	-	-	18.97	-	33.70	-
Package Plan III	24.52	-	-	-	18.23	-	31.93	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Aggressive Allocation Sub-Account (Initial Class)	MML Aggressive Allocation Sub-Account (Service Class)	MML American Funds Core Allocation Sub-Account	MML American Funds Growth Sub-Account	MML Balanced Allocation Sub-Account (Initial Class)	MML Balanced Allocation Sub-Account (Service Class)	MML Blend Sub-Account (Initial Class)	MML Blend Sub-Account (Service Class)
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	24.52	-	20.83	46.21	18.23	-	29.46	-
Tier 2	23.01	-	19.60	43.47	17.10	-	27.21	-
Tier 3	22.11	-	18.86	41.83	16.43	-	25.90	-
Tier 4	23.01	-	19.60	43.47	17.10	-	27.17	-
Tier 5	21.58	-	18.43	40.89	16.05	-	25.10	-
Tier 6	20.74	-	17.74	39.35	15.42	-	23.88	-
Tier 7	22.64	-	19.30	42.81	16.83	-	26.75	-
Tier 8	21.24	-	18.15	40.26	15.79	-	24.67	-
Tier 9	-	21.11	18.72	41.52	-	15.73	-	24.96
Tier 10	-	22.86	20.21	44.82	-	17.04	-	27.50
Tier 11	-	19.81	17.60	39.05	-	14.76	-	23.02
Tier 12	-	21.50	19.01	42.16	-	16.02	-	25.86
Tier 13	-	18.62	16.56	36.72	-	13.88	-	21.65
Tier 14	-	19.85	17.60	39.04	-	14.79	-	23.48
MassMutual RetireEase Select SM								
Tier 1	-	-	-	-	-	-	23.17	-
Tier 2	-	-	-	-	-	-	25.18	-
MassMutual Transitions Select SM								
Tier 1	26.13	-	22.15	49.13	19.43	-	33.25	-
Tier 2	-	25.12	22.15	49.13	-	18.72	-	32.00
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	-	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	-	16.67	15.39	28.64	-	13.39	-	16.26
Tier 2	-	16.20	14.95	27.83	-	13.01	-	15.80
Tier 3	-	16.67	15.39	28.64	-	13.39	-	16.26
MassMutual Capital Vantage SM								
Tier 1	-	16.60	15.32	28.52	-	13.33	-	16.19
Tier 2	-	17.08	15.77	29.35	-	13.72	-	16.66
Tier 3	-	16.00	14.77	27.49	-	12.85	-	15.61
Tier 4	-	16.60	15.32	28.52	-	13.33	-	16.19
Tier 5	-	16.47	15.20	28.29	-	13.22	-	16.06
Tier 6	-	17.08	15.77	29.35	-	13.72	-	16.66
MassMutual Envision VA	-	10.40	10.32	11.03	-	9.87	-	10.31

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Blue Chip Growth Sub-Account (Initial Class)	MML Blue Chip Growth Sub-Account (Service Class)	MML Conservative Allocation Sub-Account (Initial Class)	MML Conservative Allocation Sub-Account (Service Class)	MML Dynamic Bond Sub-Account (Service Class I)	MML Equity Sub-Account (Initial Class)	MML Equity Sub-Account (Service Class)	MML Equity Income Sub-Account (Initial Class)
ASSETS								
Investments								
Number of shares	2,909,252	10,539,264	6,075,059	26,887,376	1,458,905	828,872	3,072,674	10,794,389
Identified cost	\$ 48,168,351	\$ 162,530,432	\$ 56,964,837	\$ 247,410,338	\$ 13,982,828	\$ 21,168,303	\$ 76,009,748	\$ 105,220,024
Value	\$ 46,548,031	\$ 154,927,184	\$ 48,661,224	\$ 212,410,273	\$ 12,459,052	\$ 21,776,655	\$ 78,993,271	\$ 106,756,504
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	-	-	-	-	-
Total assets	46,548,031	154,927,184	48,661,224	212,410,273	12,459,052	21,776,655	78,993,271	106,756,504
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	1,571	-	-	-	-	333	-	2,749
Payable to Massachusetts Mutual Life Insurance Company	127	23	34	17	-	73	10	113
Total liabilities	1,698	23	34	17	-	406	10	2,862
NET ASSETS	\$ 46,546,333	\$ 154,927,161	\$ 48,661,190	\$ 212,410,256	\$ 12,459,052	\$ 21,776,249	\$ 78,993,261	\$ 106,753,642
Net Assets:								
Accumulation units - value	\$ 45,446,116	\$ 154,921,884	\$ 48,485,976	\$ 212,331,806	\$ 12,459,052	\$ 20,981,862	\$ 78,993,261	\$ 103,000,206
Contracts in payout (annuitization) period	1,100,217	5,277	175,214	78,450	-	794,387	-	3,753,436
Net assets	\$ 46,546,333	\$ 154,927,161	\$ 48,661,190	\$ 212,410,256	\$ 12,459,052	\$ 21,776,249	\$ 78,993,261	\$ 106,753,642
Outstanding units								
Contract owners	794,854	5,915,497	2,694,952	13,893,472	1,249,453	720,763	3,418,217	3,189,746
UNIT VALUE								
Panorama Premier	\$ 64.62	\$ -	\$ 17.61	\$ -	\$ -	\$ 24.25	\$ -	\$ 40.15
Panorama Passage®								
Tier 1	63.43	-	17.35	-	-	26.81	-	39.41
Tier 2	61.37	-	16.92	-	-	25.94	-	38.13
Tier 3	66.79	-	18.06	-	-	28.49	-	41.50
Tier 4	63.30	-	17.33	-	-	27.00	-	39.33
MassMutual Artistry	67.63	-	18.23	-	-	29.19	-	42.02
MassMutual Transitions®								
Custom Plan	62.43	-	18.91	-	-	37.06	-	37.66
Package Plan I	62.43	-	18.91	-	-	37.06	-	37.66
Package Plan II	57.89	-	17.89	-	-	34.36	-	34.92
Package Plan III	54.85	-	17.19	-	-	32.56	-	33.09

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)

December 31, 2023

	MML Blue Chip Growth Sub-Account (Initial Class)	MML Blue Chip Growth Sub-Account (Service Class)	MML Conservative Allocation Sub-Account (Initial Class)	MML Conservative Allocation Sub-Account (Service Class)	MML Dynamic Bond Sub-Account (Service Class I)	MML Equity Sub-Account (Initial Class)	MML Equity Sub-Account (Service Class)	MML Equity Income Sub-Account (Initial Class)
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	50.37	-	17.19	-	-	29.97	-	30.52
Tier 2	46.53	-	16.13	-	-	27.69	-	28.19
Tier 3	44.28	-	15.50	-	-	26.35	-	26.83
Tier 4	46.45	-	16.13	-	-	27.64	-	28.15
Tier 5	42.91	-	15.13	-	-	25.54	-	26.00
Tier 6	40.83	-	14.54	-	-	24.30	-	24.74
Tier 7	45.73	-	15.87	-	-	27.21	-	27.71
Tier 8	42.17	-	14.89	-	-	25.10	-	25.55
Tier 9	-	42.66	-	14.80	-	-	25.40	-
Tier 10	-	46.99	-	16.02	-	-	27.98	-
Tier 11	-	39.35	-	13.88	-	-	23.43	-
Tier 12	-	44.20	-	15.07	-	-	26.32	-
Tier 13	-	37.00	-	13.06	-	-	22.03	-
Tier 14	-	40.12	-	13.91	-	-	23.89	-
MassMutual RetireEase Select SM								
Tier 1	38.87	-	-	-	-	20.20	-	21.09
Tier 2	42.23	-	-	-	-	21.95	-	22.92
MassMutual Transitions Select SM								
Tier 1	59.83	-	18.32	-	-	33.78	-	34.44
Tier 2	-	57.55	-	17.61	-	-	32.51	-
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	-	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	-	22.90	-	12.69	9.98	-	17.85	-
Tier 2	-	22.25	-	12.34	9.69	-	17.34	-
Tier 3	-	22.90	-	12.69	9.98	-	17.85	-
MassMutual Capital Vantage SM								
Tier 1	-	22.80	-	12.64	9.94	-	17.77	-
Tier 2	-	23.46	-	13.01	10.22	-	18.29	-
Tier 3	-	21.98	-	12.19	9.58	-	17.13	-
Tier 4	-	22.80	-	12.64	9.94	-	17.77	-
Tier 5	-	22.62	-	12.54	9.85	-	17.63	-
Tier 6	-	23.46	-	13.01	10.22	-	18.29	-
MassMutual Envision VA	-	10.74	-	9.75	9.31	-	10.53	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Equity Income Sub-Account (Service Class)	MML Equity Index Sub-Account (Class I)	MML Equity Index Sub-Account (Service Class I)	MML Equity Rotation Sub-Account (Service Class I)	MML Focused Equity Sub-Account	MML Foreign Sub-Account (Initial Class)	MML Foreign Sub-Account (Service Class)	MML Fundamental Equity Sub-Account
ASSETS								
Investments								
Number of shares	7,343,235	1,057,674	966,789	136,755	3,221,421	8,659,861	976,591	2,218,966
Identified cost	\$ 72,304,861	\$ 30,546,875	\$ 25,904,069	\$ 1,750,025	\$ 21,462,278	\$ 77,729,539	\$ 8,424,626	\$ 21,298,730
Value	\$ 71,229,374	\$ 31,814,845	\$ 27,437,474	\$ 1,683,459	\$ 21,905,663	\$ 82,528,470	\$ 9,248,312	\$ 21,435,216
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	-	-	-	-	-
Total assets	71,229,374	31,814,845	27,437,474	1,683,459	21,905,663	82,528,470	9,248,312	21,435,216
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	-	964	-	-	-	1,979	-	-
Payable to Massachusetts Mutual Life Insurance Company	14	105	20	8	57	154	25	44
Total liabilities	14	1,069	20	8	57	2,133	25	44
NET ASSETS	\$ 71,229,360	\$ 31,813,776	\$ 27,437,454	\$ 1,683,451	\$ 21,905,606	\$ 82,526,337	\$ 9,248,287	\$ 21,435,172
Net Assets:								
Accumulation units - value	\$ 71,223,919	\$ 31,229,551	\$ 27,437,454	\$ 1,683,451	\$ 21,905,606	\$ 79,010,593	\$ 9,248,287	\$ 21,356,813
Contracts in payout (annuitization) period	5,441	584,225	-	-	-	3,515,744	-	78,359
Net assets	\$ 71,229,360	\$ 31,813,776	\$ 27,437,454	\$ 1,683,451	\$ 21,905,606	\$ 82,526,337	\$ 9,248,287	\$ 21,435,172
Outstanding units								
Contract owners	3,000,613	792,661	616,130	81,036	915,673	4,776,071	594,680	908,537
UNIT VALUE								
Panorama Premier	\$ -	\$ 35.70	\$ -	\$ -	\$ 33.17	\$ 16.38	\$ -	\$ 33.74
Panorama Passage®								
Tier 1	-	36.92	-	-	32.82	16.43	-	33.39
Tier 2	-	35.72	-	-	32.22	15.90	-	32.77
Tier 3	-	39.23	-	-	33.79	17.46	-	34.38
Tier 4	-	37.17	-	-	32.79	16.55	-	33.35
MassMutual Artistry	-	34.20	-	-	34.03	15.60	-	34.62
MassMutual Transitions®								
Custom Plan	-	50.53	-	-	34.96	19.71	-	35.56
Package Plan I	-	50.53	-	-	34.96	19.71	-	35.56
Package Plan II	-	46.85	-	-	33.56	18.27	-	34.14
Package Plan III	-	44.39	-	-	32.59	17.31	-	33.16

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Equity Income Sub-Account (Service Class)	MML Equity Index Sub-Account (Class I)	MML Equity Index Sub-Account (Service Class I)	MML Equity Rotation Sub-Account (Service Class I)	MML Focused Equity Sub-Account	MML Foreign Sub-Account (Initial Class)	MML Foreign Sub-Account (Service Class)	MML Fundamental Equity Sub-Account
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	-	41.31	-	-	32.59	16.29	-	33.16
Tier 2	-	38.16	-	-	31.11	15.04	-	31.64
Tier 3	-	36.32	-	-	30.22	14.32	-	30.74
Tier 4	-	38.10	-	-	31.11	15.02	-	31.64
Tier 5	-	35.20	-	-	29.69	13.87	-	30.20
Tier 6	-	33.50	-	-	28.84	13.20	-	29.33
Tier 7	-	37.51	-	-	30.75	14.78	-	31.28
Tier 8	-	34.59	-	-	29.35	13.64	-	29.85
Tier 9	25.87	-	35.01	-	30.04	-	13.81	30.56
Tier 10	28.49	-	38.56	-	31.84	-	15.21	32.39
Tier 11	23.86	-	32.29	-	28.67	-	12.74	29.16
Tier 12	26.80	-	36.27	-	30.39	-	14.31	30.91
Tier 13	22.43	-	30.37	-	27.21	-	11.98	27.67
Tier 14	24.32	-	32.92	-	28.50	-	12.99	28.99
MassMutual RetireEase Select SM								
Tier 1	-	30.62	-	-	-	9.84	-	-
Tier 2	-	33.27	-	-	-	10.70	-	-
MassMutual Transitions Select SM								
Tier 1	-	47.86	-	-	34.15	18.63	-	34.74
Tier 2	33.15	-	46.07	-	34.15	-	17.94	34.74
MassMutual Equity Edge SM								
Tier 1	-	35.84	-	-	-	-	-	-
Tier 2	-	36.48	-	-	-	-	-	-
Tier 3	-	38.13	-	-	-	-	-	-
Tier 4	-	38.13	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	18.34	-	-	-	23.24	-	11.62	23.59
Tier 2	17.82	-	-	-	22.58	-	11.29	22.93
Tier 3	18.34	-	-	-	23.24	-	11.62	23.59
MassMutual Capital Vantage SM								
Tier 1	18.26	-	-	23.22	23.14	-	11.57	23.49
Tier 2	18.79	-	-	23.89	23.81	-	11.91	24.18
Tier 3	17.60	-	-	22.38	22.31	-	11.15	22.65
Tier 4	18.26	-	-	23.22	23.14	-	11.57	23.49
Tier 5	18.12	-	-	23.03	22.95	-	11.47	23.30
Tier 6	18.79	-	-	23.89	23.81	-	11.91	24.18
MassMutual Envision VA	10.20	-	-	11.34	10.85	-	9.96	10.54

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)

December 31, 2023

	MML Fundamental Value Sub-Account	MML Global Sub-Account (Class I)	MML Global Sub-Account (Class II)	MML Global Sub-Account (Service Class I)	MML Growth Allocation Sub-Account (Initial Class)	MML Growth Allocation Sub-Account (Service Class)	MML High Yield Sub-Account	MML Income & Growth Sub-Account (Initial Class)
ASSETS								
Investments								
Number of shares	1,835,214	1,092,740	898,366	5,334,971	39,617,791	84,820,410	4,643,926	2,021,610
Identified cost	\$ 21,490,162	\$ 6,004,492	\$ 5,264,125	\$ 24,445,459	\$ 332,715,233	\$ 706,254,892	\$ 42,900,749	\$ 19,995,950
Value	\$ 21,398,596	\$ 4,644,146	\$ 4,141,467	\$ 21,339,885	\$ 285,644,273	\$ 604,769,526	\$ 39,426,929	\$ 20,337,399
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	-	-	-	-	-
Total assets	21,398,596	4,644,146	4,141,467	21,339,885	285,644,273	604,769,526	39,426,929	20,337,399
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	-	-	5	-	-	-	82	221
Payable to Massachusetts Mutual Life Insurance Company	49	84	11	12	47	41	28	97
Total liabilities	49	84	16	12	47	41	110	318
NET ASSETS	\$ 21,398,547	\$ 4,644,062	\$ 4,141,451	\$ 21,339,873	\$ 285,644,226	\$ 604,769,485	\$ 39,426,819	\$ 20,337,081
Net Assets:								
Accumulation units - value	\$ 21,398,547	\$ 4,321,356	\$ 4,141,293	\$ 21,339,873	\$ 285,644,226	\$ 604,769,485	\$ 39,424,071	\$ 19,553,458
Contracts in payout (annuitization) period	-	322,706	158	-	-	-	2,748	783,623
Net assets	\$ 21,398,547	\$ 4,644,062	\$ 4,141,451	\$ 21,339,873	\$ 285,644,226	\$ 604,769,485	\$ 39,426,819	\$ 20,337,081
Outstanding units								
Contract owners	1,160,477	182,051	224,321	1,101,260	12,416,012	28,790,959	2,723,099	638,019
UNIT VALUE								
Panorama Premier	\$ 24.98	\$ -	\$ 21.06	\$ -	\$ 22.63	\$ -	\$ 18.27	\$ 35.68
Panorama Passage®								
Tier 1	24.72	-	20.32	-	22.31	-	18.04	27.38
Tier 2	24.26	-	19.66	-	21.74	-	17.65	26.49
Tier 3	25.45	-	21.59	-	23.21	-	18.67	29.09
Tier 4	24.69	-	20.46	-	22.27	-	18.02	27.57
MassMutual Artistry	25.63	-	15.23	-	23.44	-	18.82	26.26
MassMutual Transitions®								
Custom Plan	26.33	26.62	-	-	24.31	-	19.42	35.50
Package Plan I	26.33	26.62	-	-	24.31	-	19.42	35.50
Package Plan II	25.27	24.68	-	-	22.99	-	18.52	32.92
Package Plan III	24.55	23.39	-	-	22.09	-	17.90	31.19

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Fundamental Value Sub-Account	MML Global Sub-Account (Class I)	MML Global Sub-Account (Class II)	MML Global Sub-Account (Service Class I)	MML Growth Allocation Sub-Account (Initial Class)	MML Growth Allocation Sub-Account (Service Class)	MML High Yield Sub-Account	MML Income & Growth Sub-Account (Initial Class)
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	24.55	23.22	-	-	22.09	-	17.90	28.23
Tier 2	23.43	21.45	-	-	20.73	-	16.94	26.08
Tier 3	22.76	20.42	-	-	19.92	-	16.38	24.82
Tier 4	23.43	21.42	-	-	20.73	-	16.94	26.04
Tier 5	22.36	19.79	-	-	19.45	-	16.04	24.05
Tier 6	21.72	18.83	-	-	18.69	-	15.50	22.89
Tier 7	23.16	21.08	-	-	20.40	-	16.71	25.63
Tier 8	22.10	19.45	-	-	19.14	-	15.83	23.64
Tier 9	22.62	-	-	19.75	-	19.08	16.26	-
Tier 10	23.98	-	-	21.76	-	20.66	17.41	-
Tier 11	21.59	-	-	18.22	-	17.90	15.40	-
Tier 12	22.89	-	-	20.46	-	19.43	16.49	-
Tier 13	20.49	-	-	17.13	-	16.83	14.48	-
Tier 14	21.47	-	-	18.57	-	17.94	15.29	-
MassMutual RetireEase Select SM								
Tier 1	-	18.48	-	-	-	-	-	19.97
Tier 2	-	20.08	-	-	-	-	-	21.70
MassMutual Transitions Select SM								
Tier 1	25.72	28.62	-	-	23.55	-	18.90	32.32
Tier 2	25.72	-	-	27.65	-	22.70	18.90	-
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	-	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	17.87	-	-	17.00	-	15.45	13.19	-
Tier 2	17.37	-	-	16.52	-	15.02	12.81	-
Tier 3	17.87	-	-	17.00	-	15.45	13.19	-
MassMutual Capital Vantage SM								
Tier 1	17.80	-	-	16.93	-	15.39	13.13	-
Tier 2	18.32	-	-	17.42	-	15.84	13.51	-
Tier 3	17.16	-	-	16.32	-	14.83	12.66	-
Tier 4	17.80	-	-	16.93	-	15.39	13.13	-
Tier 5	17.65	-	-	16.79	-	15.26	13.03	-
Tier 6	18.32	-	-	17.42	-	15.84	13.51	-
MassMutual Envision VA	10.71	-	-	10.00	-	10.21	10.05	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Income & Growth Sub-Account (Service Class)	MML Inflation- Protected and Income Sub-Account (Initial Class)	MML Inflation- Protected and Income Sub-Account (Service Class)	MML International Equity Sub-Account	MML iShares® 60/40 Allocation Sub-Account	MML iShares® 80/20 Allocation Sub-Account	MML Large Cap Growth Sub-Account (Initial Class)	MML Large Cap Growth Sub-Account (Service Class)
ASSETS								
Investments								
Number of shares	2,869,481	9,876,179	4,648,769	954,031	1,279,561	3,806,566	1,096,353	2,205,500
Identified cost	\$ 27,688,027	\$ 100,968,389	\$ 47,841,396	\$ 8,699,987	\$ 11,804,633	\$ 34,693,983	\$ 12,770,713	\$ 25,844,243
Value	\$ 28,235,697	\$ 86,120,282	\$ 40,118,876	\$ 9,683,411	\$ 12,501,316	\$ 37,951,461	\$ 15,239,303	\$ 28,781,769
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	-	-	1	-	-
Total assets	28,235,697	86,120,282	40,118,876	9,683,411	12,501,316	37,951,462	15,239,303	28,781,769
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	-	5,379	-	-	-	-	281	-
Payable to Massachusetts Mutual Life Insurance Company	18	268	12	28	1	-	85	3
Total liabilities	18	5,647	12	28	1	-	366	3
NET ASSETS	\$ 28,235,679	\$ 86,114,635	\$ 40,118,864	\$ 9,683,383	\$ 12,501,315	\$ 37,951,462	\$ 15,238,937	\$ 28,781,766
Net Assets:								
Accumulation units - value	\$ 28,235,679	\$ 83,158,876	\$ 40,114,633	\$ 9,683,383	\$ 12,501,315	\$ 37,951,462	\$ 15,093,076	\$ 28,781,766
Contracts in payout (annuitization) period	-	2,955,759	4,231	-	-	-	145,861	-
Net assets	\$ 28,235,679	\$ 86,114,635	\$ 40,118,864	\$ 9,683,383	\$ 12,501,315	\$ 37,951,462	\$ 15,238,937	\$ 28,781,766
Outstanding units								
Contract owners	1,338,100	6,094,042	3,388,684	759,728	1,239,115	3,671,842	348,658	1,115,328
UNIT VALUE								
Panorama Premier	\$ -	\$ 14.73	\$ -	\$ -	\$ -	\$ -	\$ 35.13	\$ -
Panorama Passage®								
Tier 1	-	14.46	-	-	-	-	35.32	-
Tier 2	-	13.99	-	-	-	-	34.17	-
Tier 3	-	15.22	-	-	-	-	37.53	-
Tier 4	-	14.43	-	-	-	-	35.56	-
MassMutual Artistry	-	15.41	-	12.15	-	-	29.14	-
MassMutual Transitions®								
Custom Plan	-	16.16	-	12.43	-	-	50.94	-
Package Plan I	-	16.16	-	12.43	-	-	50.94	-
Package Plan II	-	15.03	-	12.01	-	-	47.24	-
Package Plan III	-	14.28	-	11.73	-	-	44.76	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Income & Growth Sub-Account (Service Class)	MML Inflation- Protected and Income Sub-Account (Initial Class)	MML Inflation- Protected and Income Sub-Account (Service Class)	MML International Equity Sub-Account	MML iShares® 60/40 Allocation Sub-Account	MML iShares® 80/20 Allocation Sub-Account	MML Large Cap Growth Sub-Account (Initial Class)	MML Large Cap Growth Sub-Account (Service Class)
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	-	13.39	-	11.73	-	-	42.37	-
Tier 2	-	12.37	-	11.28	-	-	39.14	-
Tier 3	-	11.77	-	11.01	-	-	37.24	-
Tier 4	-	12.35	-	11.28	-	-	39.08	-
Tier 5	-	11.40	-	10.85	-	-	36.10	-
Tier 6	-	10.85	-	10.60	-	-	34.35	-
Tier 7	-	12.15	-	11.17	-	-	38.47	-
Tier 8	-	11.21	-	10.75	-	-	35.48	-
Tier 9	23.94	-	11.33	10.96	-	-	-	35.89
Tier 10	26.37	-	12.48	11.50	-	-	-	39.53
Tier 11	22.08	-	10.45	10.54	-	-	-	33.10
Tier 12	24.81	-	11.73	11.07	-	-	-	37.18
Tier 13	20.77	-	9.82	10.10	-	-	-	31.12
Tier 14	22.51	-	10.65	10.49	-	-	-	33.75
MassMutual RetireEase Select SM								
Tier 1	-	12.81	-	-	-	-	36.88	-
Tier 2	-	13.92	-	-	-	-	40.07	-
MassMutual Transitions Select SM								
Tier 1	-	14.48	-	12.19	-	-	53.28	-
Tier 2	31.13	-	13.92	12.19	-	-	-	51.25
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	-	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	18.69	-	10.89	13.19	-	-	-	25.96
Tier 2	18.16	-	10.58	12.81	-	-	-	25.23
Tier 3	18.69	-	10.89	13.19	-	-	-	25.96
MassMutual Capital Vantage SM								
Tier 1	18.62	-	10.85	13.13	-	-	-	25.85
Tier 2	19.16	-	11.16	13.51	-	-	-	26.60
Tier 3	17.94	-	10.46	12.66	-	-	-	24.92
Tier 4	18.62	-	10.85	13.13	-	-	-	25.85
Tier 5	18.46	-	10.76	13.03	-	-	-	25.64
Tier 6	19.16	-	11.16	13.51	-	-	-	26.60
MassMutual Envision VA	10.74	-	9.19	10.26	10.09	10.34	-	12.17

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Managed Bond Sub-Account (Initial Class)	MML Managed Bond Sub-Account (Service Class)	MML Managed Volatility Sub-Account (Initial Class)	MML Managed Volatility Sub-Account (Service Class)	MML Mid Cap Growth Sub-Account (Initial Class)	MML Mid Cap Growth Sub-Account (Service Class)	MML Mid Cap Value Sub-Account (Initial Class)	MML Mid Cap Value Sub-Account (Service Class)
ASSETS								
Investments								
Number of shares	6,739,477	15,165,135	5,027,177	1,432,537	5,737,600	9,103,620	12,392,993	6,035,928
Identified cost	\$ 83,951,358	\$ 187,771,998	\$ 64,019,486	\$ 17,911,377	\$ 77,152,577	\$ 109,364,608	\$ 112,653,649	\$ 54,537,774
Value	\$ 73,155,604	\$ 163,963,288	\$ 61,465,617	\$ 17,363,298	\$ 61,851,323	\$ 87,758,898	\$ 97,904,648	\$ 46,054,127
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	-	-	-	-	-
Total assets	73,155,604	163,963,288	61,465,617	17,363,298	61,851,323	87,758,898	97,904,648	46,054,127
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	4,408	-	1,902	-	2,760	-	4,334	-
Payable to Massachusetts Mutual Life Insurance Company	234	12	236	14	389	14	239	21
Total liabilities	4,642	12	2,138	14	3,149	14	4,573	21
NET ASSETS	\$ 73,150,962	\$ 163,963,276	\$ 61,463,479	\$ 17,363,284	\$ 61,848,174	\$ 87,758,884	\$ 97,900,075	\$ 46,054,106
Net Assets:								
Accumulation units - value	\$ 70,527,523	\$ 163,958,102	\$ 59,149,095	\$ 17,363,284	\$ 60,605,199	\$ 87,758,884	\$ 94,627,203	\$ 46,054,106
Contracts in payout (annuitization) period	2,623,439	5,174	2,314,384	-	1,242,975	-	3,272,872	-
Net assets	\$ 73,150,962	\$ 163,963,276	\$ 61,463,479	\$ 17,363,284	\$ 61,848,174	\$ 87,758,884	\$ 97,900,075	\$ 46,054,106
Outstanding units								
Contract owners	4,749,269	13,114,910	3,212,163	1,055,623	1,006,915	3,484,460	2,178,707	2,015,747
UNIT VALUE								
Panorama Premier	\$ -	\$ 12.42	\$ 17.47	\$ -	\$ 103.09	\$ -	\$ 55.96	\$ -
Panorama Passage®								
Tier 1	18.86	-	17.11	-	76.14	-	59.09	-
Tier 2	18.25	-	16.55	-	73.66	-	57.17	-
Tier 3	20.04	-	18.15	-	80.89	-	62.78	-
Tier 4	18.99	-	17.20	-	76.66	-	59.50	-
MassMutual Artistry	19.30	-	18.25	-	62.16	-	63.84	-
MassMutual Transitions®								
Custom Plan	17.93	-	23.07	-	70.83	-	51.94	-
Package Plan I	17.93	-	23.07	-	70.83	-	51.94	-
Package Plan II	16.63	-	21.39	-	65.68	-	48.16	-
Package Plan III	15.75	-	20.27	-	62.23	-	45.63	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)

December 31, 2023

	MML Managed Bond Sub-Account (Initial Class)	MML Managed Bond Sub-Account (Service Class)	MML Managed Volatility Sub-Account (Initial Class)	MML Managed Volatility Sub-Account (Service Class)	MML Mid Cap Growth Sub-Account (Initial Class)	MML Mid Cap Growth Sub-Account (Service Class)	MML Mid Cap Value Sub-Account (Initial Class)	MML Mid Cap Value Sub-Account (Service Class)
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	14.15	-	17.61	-	41.21	-	39.91	-
Tier 2	13.07	-	16.27	-	38.40	-	36.86	-
Tier 3	12.44	-	15.48	-	36.74	-	35.08	-
Tier 4	13.05	-	16.24	-	38.40	-	36.81	-
Tier 5	12.05	-	15.00	-	35.78	-	34.00	-
Tier 6	11.47	-	14.28	-	34.24	-	32.35	-
Tier 7	12.84	-	15.99	-	37.74	-	36.23	-
Tier 8	11.84	-	14.75	-	35.17	-	33.41	-
Tier 9	-	11.99	-	14.93	-	35.24	-	33.81
Tier 10	-	13.21	-	16.44	-	38.49	-	37.24
Tier 11	-	11.06	-	13.77	-	32.84	-	31.18
Tier 12	-	12.42	-	15.47	-	36.20	-	35.03
Tier 13	-	10.40	-	12.95	-	30.88	-	29.33
Tier 14	-	11.28	-	14.04	-	33.14	-	31.80
MassMutual RetireEase Select SM								
Tier 1	13.05	-	12.74	-	35.34	-	27.54	-
Tier 2	14.17	-	13.85	-	38.40	-	29.92	-
MassMutual Transitions Select SM								
Tier 1	15.35	-	20.28	-	44.23	-	44.48	-
Tier 2	-	14.78	-	19.52	-	42.59	-	42.80
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	-	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	-	10.02	-	12.59	-	19.67	-	17.56
Tier 2	-	9.74	-	12.23	-	19.12	-	17.07
Tier 3	-	10.02	-	12.59	-	19.67	-	17.56
MassMutual Capital Vantage SM								
Tier 1	-	9.98	-	12.53	-	19.59	-	17.49
Tier 2	-	10.27	-	12.90	-	20.16	-	18.00
Tier 3	-	9.62	-	12.08	-	18.89	-	16.86
Tier 4	-	9.98	-	12.53	-	19.59	-	17.49
Tier 5	-	9.90	-	12.43	-	19.43	-	17.35
Tier 6	-	10.27	-	12.90	-	20.16	-	18.00
MassMutual Envision VA	-	9.18	-	10.18	-	10.60	-	10.22

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Moderate Allocation Sub-Account (Initial Class)	MML Moderate Allocation Sub-Account (Service Class)	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account (Initial Class)	MML Small Cap Equity Sub-Account (Service Class)	MML Small Cap Growth Equity Sub-Account (Initial Class)	MML Small Cap Growth Equity Sub-Account (Service Class)	MML Small Company Value Sub-Account
ASSETS								
Investments								
Number of shares	18,769,222	114,494,046	3,418,674	2,033,050	2,379,083	6,577,831	2,780,239	3,140,576
Identified cost	\$ 184,081,620	\$ 1,108,313,751	\$ 31,830,423	\$ 19,626,134	\$ 22,829,188	\$ 75,559,369	\$ 29,978,460	\$ 29,120,419
Value	\$ 159,163,004	\$ 956,025,288	\$ 30,357,829	\$ 22,208,086	\$ 25,292,956	\$ 64,466,880	\$ 23,420,831	\$ 24,402,276
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	-	-	-	-	-
Total assets	159,163,004	956,025,288	30,357,829	22,208,086	25,292,956	64,466,880	23,420,831	24,402,276
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	-	-	64	2,471	-	3,200	-	-
Payable to Massachusetts Mutual Life Insurance Company	79	39	43	198	14	243	22	30
Total liabilities	79	39	107	2,669	14	3,443	22	30
NET ASSETS	\$ 159,162,925	\$ 956,025,249	\$ 30,357,722	\$ 22,205,417	\$ 25,292,942	\$ 64,463,437	\$ 23,420,809	\$ 24,402,246
Net Assets:								
Accumulation units - value	\$ 159,162,925	\$ 955,929,648	\$ 30,355,591	\$ 21,915,330	\$ 25,292,942	\$ 61,865,290	\$ 23,420,809	\$ 24,402,246
Contracts in payout (annuitization) period	-	95,601	2,131	290,087	-	2,598,147	-	-
Net assets	\$ 159,162,925	\$ 956,025,249	\$ 30,357,722	\$ 22,205,417	\$ 25,292,942	\$ 64,463,437	\$ 23,420,809	\$ 24,402,246
Outstanding units								
Contract owners	7,711,185	52,943,371	2,987,098	489,705	1,093,197	1,504,269	943,464	1,095,035
UNIT VALUE								
Panorama Premier	\$ 20.18	\$ -	\$ 10.36	\$ 54.42	\$ -	\$ 56.55	\$ -	\$ -
Panorama Passage®								
Tier 1	19.89	-	10.23	48.85	-	49.79	-	-
Tier 2	19.39	-	10.01	47.26	-	48.17	-	-
Tier 3	20.70	-	10.59	51.91	-	52.90	-	-
Tier 4	19.86	-	10.22	49.19	-	50.13	-	-
MassMutual Artistry	20.90	-	10.67	47.73	-	36.00	-	39.84
MassMutual Transitions®								
Custom Plan	21.68	-	11.01	46.69	-	56.35	-	-
Package Plan I	21.68	-	11.01	46.69	-	56.35	-	-
Package Plan II	20.50	-	10.50	43.30	-	52.25	-	-
Package Plan III	19.70	-	10.15	41.02	-	49.50	-	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Moderate Allocation Sub-Account (Initial Class)	MML Moderate Allocation Sub-Account (Service Class)	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account (Initial Class)	MML Small Cap Equity Sub-Account (Service Class)	MML Small Cap Growth Equity Sub-Account (Initial Class)	MML Small Cap Growth Equity Sub-Account (Service Class)	MML Small Company Value Sub-Account
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	19.70	-	10.15	36.11	-	40.95	-	37.74
Tier 2	18.49	-	9.61	33.36	-	37.82	-	35.59
Tier 3	17.76	-	9.29	31.74	-	35.99	-	34.31
Tier 4	18.49	-	9.61	33.30	-	37.76	-	35.59
Tier 5	17.34	-	9.10	30.76	-	34.88	-	33.56
Tier 6	16.67	-	8.79	29.28	-	33.20	-	32.35
Tier 7	18.19	-	9.48	32.78	-	37.17	-	35.07
Tier 8	17.07	-	8.97	30.24	-	34.28	-	33.07
Tier 9	-	16.99	9.22	-	30.55	-	34.69	34.06
Tier 10	-	18.39	9.87	-	33.65	-	38.21	36.65
Tier 11	-	15.94	8.73	-	28.17	-	32.00	32.12
Tier 12	-	17.30	9.35	-	31.65	-	35.94	34.56
Tier 13	-	14.99	8.21	-	26.49	-	30.09	30.20
Tier 14	-	15.97	8.67	-	28.73	-	32.63	32.03
MassMutual RetireEase Select SM								
Tier 1	-	-	-	27.09	-	28.62	-	-
Tier 2	-	-	-	29.43	-	31.10	-	-
MassMutual Transitions Select SM								
Tier 1	21.00	-	10.72	43.03	-	50.70	-	40.02
Tier 2	-	20.21	10.72	-	41.34	-	48.79	40.02
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	-	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	-	-
MassMutual Transitions Select SM II								
Tier 1	-	14.09	9.95	-	19.80	-	19.91	18.49
Tier 2	-	13.69	9.67	-	19.24	-	19.35	17.97
Tier 3	-	14.09	9.95	-	19.80	-	19.91	18.49
MassMutual Capital Vantage SM								
Tier 1	-	14.03	9.91	-	19.72	-	19.83	18.42
Tier 2	-	14.44	10.20	-	20.29	-	20.40	18.95
Tier 3	-	13.52	9.55	-	19.00	-	19.11	17.75
Tier 4	-	14.03	9.91	-	19.72	-	19.83	18.42
Tier 5	-	13.91	9.83	-	19.56	-	19.67	18.27
Tier 6	-	14.44	10.20	-	20.29	-	20.40	18.95
MassMutual Envision VA	-	10.00	9.80	-	10.53	9.95	-	10.11

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)

December 31, 2023

	MML Small/Mid Cap Value Sub-Account (Initial Class)	MML Small/Mid Cap Value Sub-Account (Service Class)	MML Strategic Emerging Markets Sub-Account (Service Class I)	MML Sustainable Equity Sub-Account (Initial Class)	MML Sustainable Equity Sub-Account (Service Class)	MML Total Return Bond Sub-Account	MML U.S. Government Money Market Sub-Account	PIMCO Commodity RealReturn® Strategy Sub-Account
ASSETS								
Investments								
Number of shares	8,280,911	2,801,584	2,108,927	4,060,025	3,491,103	4,077,014	116,716,578	1,255,740
Identified cost	\$ 74,740,054	\$ 27,725,905	\$ 16,375,377	\$ 61,878,101	\$ 58,927,687	\$ 42,107,131	\$ 116,716,046	\$ 9,313,295
Value	\$ 74,279,769	\$ 24,597,903	\$ 11,198,405	\$ 59,763,562	\$ 50,481,351	\$ 36,326,198	\$ 116,716,576	\$ 6,856,345
Dividends receivable	-	-	-	-	-	-	-	-
Receivable from Massachusetts Mutual Life Insurance Company	-	-	-	-	-	-	1,340	-
Total assets	74,279,769	24,597,903	11,198,405	59,763,562	50,481,351	36,326,198	116,717,916	6,856,345
LIABILITIES								
Payable to Annuitant mortality fluctuation fund reserve	2,092	-	-	5,706	-	-	4,240	62
Payable to Massachusetts Mutual Life Insurance Company	234	-	69	234	16	28	-	106
Total liabilities	2,326	-	69	5,940	16	28	4,240	168
NET ASSETS	\$ 74,277,443	\$ 24,597,903	\$ 11,198,336	\$ 59,757,622	\$ 50,481,335	\$ 36,326,170	\$ 116,713,676	\$ 6,856,177
Net Assets:								
Accumulation units - value	\$ 71,376,724	\$ 24,597,903	\$ 11,198,336	\$ 59,386,595	\$ 50,481,335	\$ 36,326,170	\$ 115,998,628	\$ 6,634,973
Contracts in payout (annuitization) period	2,900,719	-	-	371,027	-	-	715,048	221,204
Net assets	\$ 74,277,443	\$ 24,597,903	\$ 11,198,336	\$ 59,757,622	\$ 50,481,335	\$ 36,326,170	\$ 116,713,676	\$ 6,856,177
Outstanding units								
Contract owners	2,046,774	1,126,743	986,758	1,321,303	2,038,182	3,711,823	12,230,273	985,786
UNIT VALUE								
Panorama Premier	\$ 47.15	\$ -	\$ -	\$ 45.55	\$ -	\$ 9.96	\$ 8.97	\$ 6.83
Panorama Passage®								
Tier 1	46.28	-	-	44.71	-	9.85	8.84	6.72
Tier 2	44.78	-	-	43.25	-	9.67	8.61	6.53
Tier 3	48.74	-	-	47.08	-	10.15	9.20	7.02
Tier 4	46.19	-	-	44.62	-	9.84	8.82	6.71
MassMutual Artistry	49.34	-	13.57	47.67	-	10.22	9.28	7.10
MassMutual Transitions®								
Custom Plan	51.75	-	-	49.99	-	10.50	9.63	7.39
Package Plan I	51.75	-	-	49.99	-	10.50	9.63	7.39
Package Plan II	48.14	-	-	46.50	-	10.08	9.11	6.95
Package Plan III	45.71	-	-	44.16	-	9.79	8.75	6.65

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	MML Small/Mid Cap Value Sub-Account (Initial Class)	MML Small/Mid Cap Value Sub-Account (Service Class)	MML Strategic Emerging Markets Sub-Account (Service Class I)	MML Sustainable Equity Sub-Account (Initial Class)	MML Sustainable Equity Sub-Account (Service Class)	MML Total Return Bond Sub-Account	MML U.S. Government Money Market Sub-Account	PIMCO Commodity RealReturn® Strategy Sub-Account
UNIT VALUE (continued)								
MassMutual Evolution SM								
Tier 1	32.82	-	10.46	33.73	-	9.79	8.75	6.65
Tier 2	30.32	-	9.84	31.16	-	9.34	8.21	6.19
Tier 3	28.85	-	9.47	29.65	-	9.07	7.89	5.92
Tier 4	30.27	-	9.84	31.11	-	9.34	8.21	6.19
Tier 5	27.96	-	9.26	28.73	-	8.91	7.71	5.77
Tier 6	26.61	-	8.91	27.34	-	8.66	7.40	5.52
Tier 7	29.80	-	9.69	30.62	-	9.23	8.08	6.09
Tier 8	27.48	-	9.12	28.24	-	8.81	7.58	5.67
Tier 9	-	27.82	9.40	-	28.57	9.02	7.84	5.90
Tier 10	-	30.65	10.15	-	31.47	9.56	8.49	6.45
Tier 11	-	25.66	8.84	-	26.35	8.61	7.36	5.50
Tier 12	-	28.83	9.55	-	29.60	9.12	7.99	6.06
Tier 13	-	24.13	8.31	-	24.78	8.17	6.92	5.17
Tier 14	-	26.16	8.84	-	26.87	8.56	7.37	5.55
MassMutual RetireEase Select SM								
Tier 1	21.46	-	-	26.26	-	-	8.96	6.68
Tier 2	23.32	-	-	28.53	-	-	9.38	7.25
MassMutual Transitions Select SM								
Tier 1	36.46	-	11.13	39.02	-	10.25	9.33	7.13
Tier 2	-	35.10	11.13	-	37.54	10.25	9.33	7.13
MassMutual Equity Edge SM								
Tier 1	-	-	-	-	-	-	8.86	-
Tier 2	-	-	-	-	-	-	-	-
Tier 3	-	-	-	-	-	-	-	-
Tier 4	-	-	-	-	-	-	9.26	-
MassMutual Transitions Select SM II								
Tier 1	-	17.39	11.55	-	22.09	9.72	9.88	-
Tier 2	-	16.90	11.22	-	21.47	9.45	9.60	-
Tier 3	-	17.39	11.55	-	22.09	9.72	9.88	-
MassMutual Capital Vantage SM								
Tier 1	-	17.32	11.50	-	22.00	9.68	9.84	-
Tier 2	-	17.82	11.83	-	22.64	9.96	10.13	-
Tier 3	-	16.70	11.09	-	21.21	9.33	9.49	-
Tier 4	-	17.32	11.50	-	22.00	9.68	9.84	-
Tier 5	-	17.18	11.41	-	21.82	9.60	9.76	-
Tier 6	-	17.82	11.83	-	22.64	9.96	10.13	-
MassMutual Envision VA	-	10.16	8.48	11.13	-	9.11	10.34	-

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	PIMCO Income Sub-Account	VY® CBRE Global Real Estate Sub-Account
ASSETS		
Investments		
Number of shares	212,462	894,674
Identified cost	\$ 2,076,415	\$ 9,426,920
Value	\$ 2,113,999	\$ 9,161,460
Dividends receivable	-	-
Receivable from Massachusetts Mutual Life Insurance Company	180	-
Total assets	2,114,179	9,161,460
LIABILITIES		
Payable to Annuitant mortality fluctuation fund reserve	-	55
Payable to Massachusetts Mutual Life Insurance Company	-	82
Total liabilities	-	137
NET ASSETS	\$ 2,114,179	\$ 9,161,323
Net Assets:		
Accumulation units - value	\$ 2,114,179	\$ 8,695,691
Contracts in payout (annuitization) period	-	465,632
Net assets	\$ 2,114,179	\$ 9,161,323
Outstanding units		
Contract owners	212,500	542,067
UNIT VALUE		
Panorama Premier	\$ -	\$ 16.7
Panorama Passage®		
Tier 1	-	16.4
Tier 2	-	16.0
Tier 3	-	17.2
Tier 4	-	16.4
MassMutual Artistry	-	17.4
MassMutual Transitions®		
Custom Plan	-	18.1
Package Plan I	-	18.1
Package Plan II	-	17.0
Package Plan III	-	16.3

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF ASSETS AND LIABILITIES (Continued)
December 31, 2023

	PIMCO Income Sub-Account	VY® CBRE Global Real Estate Sub-Account
UNIT VALUE (continued)		
MassMutual Evolution SM		
Tier 1	32.82	-
Tier 2	30.32	-
Tier 3	28.85	-
Tier 4	30.27	-
Tier 5	27.96	-
Tier 6	26.61	-
Tier 7	29.80	-
Tier 8	27.48	-
Tier 9	-	27.82
Tier 10	-	30.65
Tier 11	-	25.66
Tier 12	-	28.83
Tier 13	-	24.13
Tier 14	-	26.16
MassMutual RetireEase Select SM		
Tier 1	21.46	-
Tier 2	23.32	-
MassMutual Transitions Select SM		
Tier 1	36.46	-
Tier 2	-	35.10
MassMutual Equity Edge SM		
Tier 1	-	-
Tier 2	-	-
Tier 3	-	-
Tier 4	-	-
MassMutual Transitions Select SM II		
Tier 1	-	-
Tier 2	-	-
Tier 3	-	-
MassMutual Capital Vantage SM		
Tier 1	-	-
Tier 2	-	17.39
Tier 3	-	16.90
Tier 4	-	17.39
Tier 5	-	-
Tier 6	-	17.32
MassMutual Envision VA	-	17.82

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

**STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS
For The Year Ended December 31, 2023**

	BlackRock 60/40 Target Allocation ETF V.I. Sub-Account (Class III)	Choe Vest U.S. Large Cap 10% Buffer Strategies V.I. Sub-Account	Delaware Ivy VIP Asset Strategy Sub-Account (Class II)	Fidelity® VIP Contrafund® Sub-Account (Initial Class)	Fidelity® VIP Contrafund® Sub-Account (Service Class 2)	Fidelity® VIP Health Care Sub-Account	Fidelity® VIP Overseas Sub-Account (Service Class 2)	Fidelity® VIP Real Estate Sub-Account
Investment income								
Dividends	\$ 335,506	\$ -	\$ 228,800	\$ 835,624	\$ 549,089	\$ -	\$ 1,156	\$ 9,941
Expenses								
Mortality and expense risk fee and administrative charges	177,425	2,670	140,298	2,212,449	2,696,527	8,990	558	3,738
Net Investment income (loss)	158,081	(2,670)	88,502	(1,376,825)	(2,147,438)	(8,990)	598	6,203
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	28,252	280	(63,290)	9,383,835	7,157,514	(919)	12	(4,851)
Realized gain distribution	-	3,828	-	6,224,310	7,795,141	-	387	6,570
Realized gain (loss)	28,252	4,108	(63,290)	15,608,145	14,952,655	(919)	399	1,719
Change in net unrealized appreciation/depreciation of investments	2,154,128	29,545	1,254,431	35,467,457	45,038,983	39,550	9,356	37,122
Net gain (loss) on investments	2,182,380	33,653	1,191,141	51,075,602	59,991,638	38,631	9,755	38,841
Net increase (decrease) in net assets resulting from operations	2,340,461	30,983	1,279,643	49,698,777	57,844,200	29,641	10,353	45,044
Capital transactions:								
Transfers of net premiums	800,851	462,023	217,872	1,174,846	8,454,485	472,009	143,726	309,371
Transfers due to death benefits	-	-	(88,514)	(3,055,994)	(2,102,699)	-	-	-
Transfers due to annuity benefit payments	-	-	-	(669,373)	(420)	-	-	-
Transfers due to withdrawal of funds	(1,014,571)	(64)	(1,273,906)	(19,495,263)	(24,133,091)	(4,311)	14	(164)
Transfers due to loans, net of repayments	-	-	-	8,526	-	-	-	-
Transfers due to charges for administrative and insurance costs	-	-	2,226	(495,944)	(187,266)	-	-	-
Transfers due to contingent deferred sales charges	-	(2,803)	(1,423)	(1,051)	(23,129)	(3,616)	(231)	(1,415)
Transfers due to net charge (credit) to annuitant mortality fluctuation	1	-	-	280,386	47	-	-	-
Transfers between Sub-Accounts and to/from General Account	271,554	(2,100)	79,010	(8,337,453)	(133,028)	128,847	134	26,311
Net increase (decrease) in net assets resulting from capital transactions	57,835	457,056	(1,064,735)	(30,591,320)	(18,125,101)	592,929	143,643	334,103
Total increase (decrease)	2,398,296	488,039	214,908	19,107,457	39,719,099	622,570	153,996	379,147
NET ASSETS, at beginning of the year	16,425,190	-	10,874,142	168,304,213	191,667,565	447,027	-	152,225
NET ASSETS, at end of the year	\$ 18,823,486	\$ 488,039	\$ 11,089,050	\$ 187,411,670	\$ 231,386,664	\$ 1,069,597	\$ 153,996	\$ 531,372

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	Fidelity® VIP Strategic Income Sub-Account	Invesco Oppenheimer V.I. International Growth Sub-Account (Series I)	Invesco Oppenheimer V.I. International Growth Sub-Account (Series II)	Invesco V.I. Capital Appreciation Sub-Account (Series I)	Invesco V.I. Capital Appreciation Sub-Account (Series II)	Invesco V.I. Conservative Balanced Sub-Account (Series I)	Invesco V.I. Conservative Balanced Sub-Account (Series II)	Invesco V.I. Core Plus Bond Sub-Account
Investment income								
Dividends	\$ 29,195	\$ 120,451	\$ 59,351	\$ -	\$ -	\$ 99,964	\$ 226	\$ 35,956
Expenses								
Mortality and expense risk fee and administrative charges	4,792	245,846	245,724	1,387,182	107,541	60,978	427	17,964
Net Investment income (loss)	24,403	(125,395)	(186,373)	(1,387,182)	(107,541)	38,986	(201)	17,992
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(1,421)	(784,661)	(772,395)	(7,981,198)	(776,244)	176,483	6,203	(23,359)
Realized gain distribution	-	-	-	-	-	-	-	-
Realized gain (loss)	(1,421)	(784,661)	(772,395)	(7,981,198)	(776,244)	176,483	6,203	(23,359)
Change in net unrealized appreciation/depreciation of investments	14,746	4,663,626	4,400,291	42,395,373	3,214,244	355,762	(2,647)	67,752
Net gain (loss) on investments	13,325	3,878,965	3,627,896	34,414,175	2,438,000	532,245	3,556	44,393
Net increase (decrease) in net assets resulting from operations	37,728	3,753,570	3,441,523	33,026,993	2,330,459	571,231	3,355	62,385
Capital transactions:								
Transfers of net premiums	447,616	138,678	438,460	443,192	45,984	19,942	-	-
Transfers due to death benefits	-	(281,029)	(118,269)	(1,567,789)	(8,939)	(71,229)	-	(81,383)
Transfers due to annuity benefit payments	-	(65,687)	-	(306,035)	-	(3,954)	-	(41)
Transfers due to withdrawal of funds	(1,320)	(1,713,790)	(2,454,765)	(12,575,713)	(1,581,762)	(427,251)	(35,253)	(55,589)
Transfers due to loans, net of repayments	-	(2,142)	-	2,590	-	(198)	-	-
Transfers due to charges for administrative and insurance costs	-	(90,086)	(86,728)	(394,624)	(19,385)	(3,947)	3	-
Transfers due to contingent deferred sales charges	(3,091)	(226)	(1,725)	(428)	-	(48)	-	(26)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	(10,576)	-	48,123	-	(41)	-	8
Transfers between Sub-Accounts and to/from General Account	16,677	(813,155)	266,281	(5,865,461)	528,927	(40,404)	-	(673)
Net increase (decrease) in net assets resulting from capital transactions	459,882	(2,838,013)	(1,956,746)	(20,216,145)	(1,035,175)	(527,130)	(35,250)	(137,704)
Total increase (decrease)	497,610	915,557	1,484,777	12,810,848	1,295,284	44,101	(31,895)	(75,319)
NET ASSETS, at beginning of the year	201,143	20,298,479	18,848,749	103,556,439	7,405,869	5,338,477	45,427	1,419,773
NET ASSETS, at end of the year	\$ 698,753	\$ 21,214,036	\$ 20,333,526	\$ 116,367,287	\$ 8,701,153	\$ 5,382,578	\$ 13,532	\$ 1,344,454

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series I)	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series II)	Invesco V.I. Diversified Dividend Sub-Account (Series I)	Invesco V.I. Diversified Dividend Sub-Account (Series II)	Invesco V.I. Global Sub-Account (Series I)	Invesco V.I. Global Sub-Account (Series II)	Invesco V.I. Global Strategic Income Sub-Account (Series I)	Invesco V.I. Global Strategic Income Sub-Account (Series II)
Investment income								
Dividends	\$ -	\$ -	\$ 84,978	\$ 149,624	\$ 268,590	\$ -	\$ -	\$ -
Expenses								
Mortality and expense risk fee and administrative charges	903,052	296,622	51,440	115,769	1,481,253	696,119	1,285,152	526,924
Net investment income (loss)	(903,052)	(296,622)	33,538	33,855	(1,212,663)	(696,119)	(1,285,152)	(526,924)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(3,637,913)	(1,529,651)	(37,127)	(185,296)	(2,473,795)	(2,245,671)	(4,744,220)	(1,341,756)
Realized gain distribution	-	-	349,966	710,680	13,582,538	6,377,757	-	-
Realized gain (loss)	(3,637,913)	(1,529,651)	312,839	525,384	11,108,743	4,132,086	(4,744,220)	(1,341,756)
Change in net unrealized appreciation/depreciation of investments	12,553,712	4,377,718	(28,749)	29,459	24,990,251	12,009,906	13,299,904	4,802,945
Net gain (loss) on investments	8,915,799	2,848,067	284,090	554,843	36,098,994	16,141,992	8,555,684	3,461,189
Net increase (decrease) in net assets resulting from operations	8,012,747	2,551,445	317,628	588,698	34,886,331	15,445,873	7,270,532	2,934,265
Capital transactions:								
Transfers of net premiums	352,755	1,338,725	96,817	43,096	666,762	1,329,874	559,455	383,955
Transfers due to death benefits	(757,126)	(167,654)	(21,388)	(79,886)	(2,044,181)	(522,398)	(1,884,936)	(388,601)
Transfers due to annuity benefit payments	(234,329)	(178)	(11,720)	-	(335,775)	(425)	(307,538)	-
Transfers due to withdrawal of funds	(8,193,830)	(1,867,419)	(589,720)	(1,326,971)	(12,759,321)	(6,971,294)	(11,686,565)	(4,156,207)
Transfers due to loans, net of repayments	(5,385)	-	(16,297)	-	3,383	-	2,938	-
Transfers due to charges for administrative and insurance costs	(271,343)	(13,289)	(8,102)	(5,359)	(336,764)	(148,852)	(456,364)	(275,400)
Transfers due to contingent deferred sales charges	(123)	(1,596)	-	-	(630)	(793)	(446)	(10)
Transfers due to net charge (credit) to annuitant mortality fluctuation	39,977	20	3,125	-	74,573	48	79,489	-
Transfers between Sub-Accounts and to/from General Account	4,233,963	(51,089)	50,754	(161,766)	(8,971,801)	(464,009)	(220,446)	378,468
Net increase (decrease) in net assets resulting from capital transactions	(4,835,441)	(762,480)	(496,531)	(1,530,886)	(23,703,754)	(6,777,849)	(13,914,413)	(4,057,795)
Total increase (decrease)	3,177,306	1,788,965	(178,903)	(942,188)	11,182,577	8,668,024	(6,643,881)	(1,123,530)
NET ASSETS, at beginning of the year	69,315,183	22,846,294	4,603,701	9,489,706	115,923,743	49,427,513	105,617,322	42,908,119
NET ASSETS, at end of the year	\$ 72,492,489	\$ 24,635,259	\$ 4,424,798	\$ 8,547,518	\$127,106,320	\$ 58,095,537	\$ 98,973,441	\$ 41,784,589

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	Invesco V.I. Health Care Sub-Account (Series I)	Invesco V.I. Health Care Sub-Account (Series II)	Invesco V.I. Main Street Sub-Account (Series I)	Invesco V.I. Main Street Sub-Account (Series II)	Invesco V.I. Technology Sub-Account (Series I)	Invesco V.I. Technology Sub-Account (Series II)	Invesco V.I. U.S. Government Money Sub-Account	Janus Henderson Global Technology and Innovation Sub-Account
Investment income								
Dividends	\$ -	\$ -	\$ 234,871	\$ 97,444	\$ -	\$ -	\$ 271,935	\$ -
Expenses								
Mortality and expense risk fee and administrative charges	98,319	99,377	317,149	246,848	76,297	94,348	66,588	5,526
Net Investment income (loss)	(98,319)	(99,377)	(82,278)	(149,404)	(76,297)	(94,348)	205,347	(5,526)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(136,822)	(179,822)	(2,056,271)	(2,281,032)	(637,555)	(1,339,567)	-	(8,855)
Realized gain distribution	-	-	1,909,803	1,391,303	-	-	-	-
Realized gain (loss)	(136,822)	(179,822)	(146,468)	(889,729)	(637,555)	(1,339,567)	-	(8,855)
Change in net unrealized appreciation/depreciation of investments	373,053	369,508	5,838,277	4,886,764	3,108,300	4,124,012	-	181,473
Net gain (loss) on investments	236,231	189,686	5,691,809	3,997,035	2,470,745	2,784,445	-	172,618
Net increase (decrease) in net assets resulting from operations	137,912	90,309	5,609,531	3,847,631	2,394,448	2,690,097	205,347	167,092
Capital transactions:								
Transfers of net premiums	97,305	68,282	90,002	306,678	143,423	78,544	95,018	254,391
Transfers due to death benefits	(123,644)	(3,378)	(532,640)	(130,778)	(122,159)	(7,767)	(619,039)	-
Transfers due to annuity benefit payments	(34,070)	-	(24,014)	-	(20,110)	(180)	(7,924)	-
Transfers due to withdrawal of funds	(858,716)	(1,165,229)	(2,009,811)	(2,241,866)	(659,704)	(1,197,588)	(1,400,368)	234
Transfers due to loans, net of repayments	881	-	2,652	-	(3)	-	-	-
Transfers due to charges for administrative and insurance costs	(8,435)	(12,585)	(17,400)	(3,424)	(8,326)	(3,940)	25,644	-
Transfers due to contingent deferred sales charges	(169)	-	(289)	-	(91)	-	(147)	(2,531)
Transfers due to net charge (credit) to annuitant mortality fluctuation	10,043	-	4,755	-	7,921	21	1,835	-
Transfers between Sub-Accounts and to/from General Account	64,995	(176,546)	(495,649)	(445,896)	662,106	252,018	988,284	39,935
Net increase (decrease) in net assets resulting from capital transactions	(851,810)	(1,289,456)	(2,982,394)	(2,515,286)	3,057	(878,892)	(916,697)	292,029
Total increase (decrease)	(713,898)	(1,199,147)	2,627,137	1,332,345	2,397,505	1,811,205	(711,350)	459,121
NET ASSETS, at beginning of the year	8,993,115	8,644,331	26,861,840	18,959,328	5,414,369	6,511,762	6,701,851	244,729
NET ASSETS, at end of the year	\$ 8,279,217	\$ 7,445,184	\$ 29,488,977	\$ 20,291,673	\$ 7,811,874	\$ 8,322,967	\$ 5,990,501	\$ 703,850

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	MML Aggressive Allocation Sub-Account (Initial Class)	MML Aggressive Allocation Sub-Account (Service Class)	MML American Funds Core Allocation Sub-Account	MML American Funds Growth Sub-Account	MML Balanced Allocation Sub-Account (Initial Class)	MML Balanced Allocation Sub-Account (Service Class)	MML Blend Sub-Account (Initial Class)	MML Blend Sub-Account (Service Class)
Investment income								
Dividends	\$ 763,010	\$ 1,792,157	\$ 25,340,067	\$ 3,043,123	\$ 1,744,712	\$ 7,467,948	\$ 855,642	\$ 2,598,291
Expenses								
Mortality and expense risk fee and administrative charges	316,616	841,692	8,702,428	2,675,950	722,922	3,286,951	616,663	2,253,778
Net Investment income (loss)	446,394	950,465	16,637,639	367,173	1,021,790	4,180,997	238,979	344,513
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(1,147,266)	(2,332,809)	(23,357,096)	(3,176,254)	(2,062,745)	(10,064,997)	(2,002,744)	(4,757,525)
Realized gain distribution	3,141,376	8,191,454	74,634,687	32,471,054	4,484,866	21,140,489	-	-
Realized gain (loss)	1,994,110	5,858,645	51,277,591	29,294,800	2,422,121	11,075,492	(2,002,744)	(4,757,525)
Change in net unrealized appreciation/depreciation of investments	1,654,005	3,732,575	12,762,460	35,768,361	2,406,622	11,117,082	9,377,779	30,809,868
Net gain (loss) on investments	3,648,115	9,591,220	64,040,051	65,063,161	4,828,743	22,192,574	7,375,035	26,052,343
Net increase (decrease) in net assets resulting from operations	4,094,509	10,541,685	80,677,690	65,430,334	5,850,533	26,373,571	7,614,014	26,396,856
Capital transactions:								
Transfers of net premiums	476,691	2,080,469	5,600,402	12,820,964	285,695	5,742,689	233,108	4,454,411
Transfers due to death benefits	(4,254)	(166,364)	(4,527,322)	(1,958,051)	(916,092)	(2,773,018)	(1,431,250)	(1,792,776)
Transfers due to annuity benefit payments	-	-	(35,172)	(21,699)	-	(7,799)	(105,398)	-
Transfers due to withdrawal of funds	(4,208,351)	(10,415,598)	(111,881,308)	(27,984,669)	(8,564,010)	(40,067,000)	(6,467,804)	(15,089,735)
Transfers due to loans, net of repayments	(4,371)	-	24,688	(6,340)	9,678	-	(8,481)	-
Transfers due to charges for administrative and insurance costs	(93,219)	(100,400)	(5,341,754)	(444,628)	(440,288)	(1,218,191)	(58,171)	(47,582)
Transfers due to contingent deferred sales charges	(5)	-	(48,238)	(58,729)	-	(13,578)	(744)	(17,468)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	-	7,291	2,693	-	817	(61,083)	-
Transfers between Sub-Accounts and to/from General Account	(89,482)	78,342	1,126,139	28,449	(413,413)	(2,930,521)	(199,989)	1,233,174
Net increase (decrease) in net assets resulting from capital transactions	(3,922,991)	(8,523,551)	(115,075,274)	(17,622,010)	(10,038,430)	(41,266,601)	(8,099,812)	(11,259,976)
Total increase (decrease)	171,518	2,018,134	(34,397,584)	47,808,324	(4,187,897)	(14,893,030)	(485,798)	15,136,880
NET ASSETS, at beginning of the year	26,453,572	68,477,846	692,811,278	187,123,822	58,629,976	267,376,596	51,298,275	172,514,255
NET ASSETS, at end of the year	\$ 26,625,090	\$ 70,495,980	\$ 658,413,694	\$ 234,932,146	\$ 54,442,079	\$ 252,483,566	\$ 50,812,477	\$ 187,651,135

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	MML Blue Chip Growth Sub-Account (Initial Class)	MML Blue Chip Growth Sub-Account (Service Class)	MML Conservative Allocation Sub-Account (Initial Class)	MML Conservative Allocation Sub-Account (Service Class)	MML Dynamic Bond Sub-Account (Service Class I)	MML Equity Sub-Account (Initial Class)	MML Equity Sub-Account (Service Class)	MML Equity Income Sub-Account (Initial Class)
Investment income								
Dividends	\$ -	\$ -	\$ 1,572,900	\$ 6,698,734	\$ 509,004	\$ 456,547	\$ 1,474,261	\$ 2,405,604
Expenses								
Mortality and expense risk fee and administrative charges	523,403	1,767,054	599,063	2,877,779	147,978	268,029	1,012,826	1,316,201
Net investment income (loss)	(523,403)	(1,767,054)	973,837	3,820,955	361,026	188,518	461,435	1,089,403
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(1,931,615)	(8,800,208)	(2,065,831)	(9,694,518)	(329,684)	52,251	(1,948,485)	(2,703,032)
Realized gain distribution	-	-	3,529,951	16,509,017	-	1,739,740	6,504,460	8,645,605
Realized gain (loss)	(1,931,615)	(8,800,208)	1,464,120	6,814,499	(329,684)	1,791,991	4,555,975	5,942,573
Change in net unrealized appreciation/depreciation of investments	19,199,647	63,361,099	2,334,585	10,039,522	737,415	(329,235)	727,912	1,250,299
Net gain (loss) on investments	17,268,032	54,560,891	3,798,705	16,854,021	407,731	1,462,756	5,283,887	7,192,872
Net increase (decrease) in net assets resulting from operations	16,744,629	52,793,837	4,772,542	20,674,976	768,757	1,651,274	5,745,322	8,282,275
Capital transactions:								
Transfers of net premiums	329,069	4,320,675	92,483	2,811,327	739,207	128,315	1,093,295	507,067
Transfers due to death benefits	(731,433)	(1,314,927)	(105,465)	(4,103,353)	(38,995)	(306,946)	(311,471)	(1,352,911)
Transfers due to annuity benefit payments	(98,066)	(523)	(15,574)	(6,983)	-	(61,837)	-	(337,792)
Transfers due to withdrawal of funds	(5,164,684)	(15,660,692)	(7,755,542)	(34,471,497)	(1,440,121)	(1,907,479)	(11,837,091)	(13,281,142)
Transfers due to loans, net of repayments	(7,521)	-	-	-	-	3,621	-	(11,673)
Transfers due to charges for administrative and insurance costs	(64,134)	(64,339)	(414,377)	(1,068,669)	-	(46,936)	(270,590)	(391,914)
Transfers due to contingent deferred sales charges	(399)	(26,187)	(6)	(3,703)	(9,848)	(143)	(3,025)	(223)
Transfers due to net charge (credit) to annuitant mortality fluctuation	29,352	59	2,471	1,360	-	24,898	-	80,277
Transfers between Sub-Accounts and to/from General Account	(1,510,068)	(1,277,636)	1,237,961	(4,239,955)	545,311	(454,276)	(2,612,413)	391,409
Net increase (decrease) in net assets resulting from capital transactions	(7,217,884)	(14,023,570)	(6,958,049)	(41,081,473)	(204,446)	(2,620,783)	(13,941,295)	(14,396,902)
Total increase (decrease)	9,526,745	38,770,267	(2,185,507)	(20,406,497)	564,311	(969,509)	(8,195,973)	(6,114,627)
NET ASSETS, at beginning of the year	37,019,588	116,156,894	50,846,697	232,816,753	11,894,741	22,745,758	87,189,234	112,868,269
NET ASSETS, at end of the year	\$ 46,546,333	\$ 154,927,161	\$ 48,661,190	\$ 212,410,256	\$ 12,459,052	\$ 21,776,249	\$ 78,993,261	\$ 106,753,642

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	MML Equity Income Sub-Account (Service Class)	MML Equity Index Sub-Account (Class I)	MML Equity Index Sub-Account (Service Class I)	MML Equity Rotation Sub-Account (Service Class I)	MML Focused Equity Sub-Account	MML Foreign Sub-Account (Initial Class)	MML Foreign Sub-Account (Service Class)	MML Fundamental Equity Sub-Account
Investment income								
Dividends	\$ 1,483,820	\$ 375,603	\$ 284,275	\$ 26,997	\$ 174,709	\$ 1,137,707	\$ 113,003	\$ 154,835
Expenses								
Mortality and expense risk fees and administrative charges	930,507	381,446	359,677	19,860	271,584	1,054,599	115,106	255,764
Net investment income (loss)	553,313	(5,843)	(75,402)	7,137	(96,875)	83,108	(2,103)	(100,929)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(3,052,626)	187,774	(724,460)	(89,087)	542,247	(2,297,790)	(249,869)	(431,614)
Realized gain distribution	6,074,701	2,776,996	2,846,180	2,821	2,060,558	-	-	-
Realized gain (loss)	3,022,075	2,964,770	2,121,720	(86,266)	2,602,805	(2,297,790)	(249,869)	(431,614)
Change in net unrealized appreciation/depreciation of investments	1,722,592	3,594,585	4,215,810	407,709	(766,537)	13,616,161	1,481,723	4,418,895
Net gain (loss) on investments	4,744,667	6,559,355	6,337,530	321,443	1,836,268	11,318,371	1,231,854	3,987,281
Net increase (decrease) in net assets resulting from operations	5,297,980	6,553,512	6,262,128	328,580	1,739,393	11,401,479	1,229,751	3,886,352
Capital transactions:								
Transfers of net premiums	1,463,163	294,705	117,230	164,536	1,280,261	333,381	108,410	861,025
Transfers due to death benefits	(526,571)	(370,220)	(118,574)	(26,040)	(111,310)	(890,522)	(82,526)	(139,012)
Transfers due to annuity benefit payments	(586)	(109,006)	-	-	-	(313,399)	-	(9,690)
Transfers due to withdrawal of funds	(10,478,680)	(3,339,807)	(8,032,854)	(561,139)	(2,324,407)	(9,854,374)	(904,602)	(2,801,568)
Transfers due to loans, net of repayments	-	4,192	-	-	-	(4,559)	-	-
Transfers due to charges for administrative and insurance costs	(347,746)	(16,925)	(100,508)	-	119	(381,312)	(72,202)	(402)
Transfers due to contingent deferred sales charges	(6,206)	(270)	-	(2,345)	(4,100)	(52)	(129)	(957)
Transfers due to net charge (credit) to annuitant mortality fluctuation	67	(123,875)	-	-	-	61,823	-	1,881
Transfers between Sub-Accounts and to/from General Account	(2,583,977)	1,099,618	(329,714)	(84,347)	(261,059)	(7,261,854)	146,177	896,830
Net increase (decrease) in net assets resulting from capital transactions	(12,480,536)	(2,561,588)	(8,464,420)	(509,335)	(1,420,496)	(18,310,868)	(804,872)	(1,191,893)
Total increase (decrease)	(7,182,556)	3,991,924	(2,202,292)	(180,755)	318,897	(6,909,389)	424,879	2,694,459
NET ASSETS, at beginning of the year	78,411,916	27,821,852	29,639,746	1,864,206	21,586,709	89,435,726	8,823,408	18,740,713
NET ASSETS, at end of the year	\$ 71,229,360	\$ 31,813,776	\$ 27,437,454	\$ 1,683,451	\$ 21,905,606	\$ 82,526,337	\$ 9,248,287	\$ 21,435,172

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	MML Fundamental Value Sub-Account	MML Global Sub-Account (Class I)	MML Global Sub-Account (Class II)	MML Global Sub-Account (Service Class I)	MML Growth Allocation Sub-Account (Initial Class)	MML Growth Allocation Sub-Account (Service Class)	MML High Yield Sub-Account	MML Income & Growth Sub-Account (Initial Class)
Investment income								
Dividends	\$ 230,159	\$ 40,232	\$ 33,820	\$ 169,993	\$ 8,248,879	\$ 15,769,825	\$ 2,520,925	\$ 421,826
Expenses								
Mortality and expense risk fees and administrative charges	256,219	50,534	52,438	258,572	3,651,810	7,219,225	465,087	236,902
Net investment income (loss)	(26,060)	(10,302)	(18,618)	(88,579)	4,597,069	8,550,600	2,055,838	184,924
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(562,255)	(874,429)	(919,351)	(4,906,565)	(9,349,681)	(18,077,377)	(1,375,246)	(299,293)
Realized gain distribution	1,284,440	281,910	233,464	1,376,521	35,934,536	75,625,592	-	2,545,666
Realized gain (loss)	722,185	(592,519)	(685,887)	(3,530,044)	26,584,855	57,548,215	(1,375,246)	2,246,373
Change in net unrealized appreciation/depreciation of investments	1,638,351	1,145,088	1,202,798	6,063,474	7,114,365	13,303,559	3,423,428	(888,514)
Net gain (loss) on investments	2,360,536	552,569	516,911	2,533,430	33,699,220	70,851,774	2,048,182	1,357,859
Net increase (decrease) in net assets resulting from operations	2,334,476	542,267	498,293	2,444,851	38,296,289	79,402,374	4,104,020	1,542,783
Capital transactions:								
Transfers of net premiums	1,258,815	14,690	44,781	1,079,562	2,394,141	9,244,641	1,042,323	146,295
Transfers due to death benefits	(260,664)	(33,530)	(64,742)	(74,820)	(1,649,388)	(3,221,497)	(635,404)	(477,768)
Transfers due to annuity benefit payments	-	(35,074)	(32)	-	-	-	(506)	(85,562)
Transfers due to withdrawal of funds	(2,629,335)	(281,377)	(321,253)	(1,623,354)	(28,671,051)	(56,320,830)	(5,085,697)	(2,100,367)
Transfers due to loans, net of repayments	65	-	4,819	-	8,741	-	6,415	322
Transfers due to charges for administrative and insurance costs	788	(16,268)	-	(68,766)	(4,044,211)	(6,289,577)	2,741	(30,239)
Transfers due to contingent deferred sales charges	(5,981)	-	(107)	(3,551)	(223)	(43,775)	(2,475)	(365)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	14,358	7	-	-	-	248	(15,965)
Transfers between Sub-Accounts and to/from General Account	69,663	341,869	3,282	(40,390)	(2,746,670)	(1,720,663)	2,506,646	242,842
Net increase (decrease) in net assets resulting from capital transactions	(1,566,649)	4,668	(333,245)	(731,319)	(34,708,661)	(58,351,701)	(2,165,709)	(2,320,807)
Total increase (decrease)	767,827	546,935	165,048	1,713,532	3,587,628	21,050,673	1,938,311	(778,024)
NET ASSETS, at beginning of the year	20,630,720	4,097,127	3,976,403	19,626,341	282,056,598	583,718,812	37,488,508	21,115,105
NET ASSETS, at end of the year	\$ 21,398,547	\$ 4,644,062	\$ 4,141,451	\$ 21,339,873	\$ 285,644,226	\$ 604,769,485	\$ 39,426,819	\$ 20,337,081

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	MML Income & Growth Sub-Account (Service Class)	MML Inflation- Protected and Income Sub-Account (Initial Class)	MML Inflation- Protected and Income Sub-Account (Service Class)	MML International Equity Sub-Account	MML iShares® 60/40 Allocation Sub-Account	MML iShares® 80/20 Allocation Sub-Account	MML Large Cap Growth Sub-Account (Initial Class)	MML Large Cap Growth Sub-Account (Service Class)
Investment income								
Dividends	\$ 513,069	\$ 4,107,884	\$ 1,819,353	\$ 100,166	\$ 191,861	\$ 469,537	\$ -	\$ -
Expenses								
Mortality and expense risk fees and administrative charges	343,435	1,152,429	535,486	106,614	110,772	358,540	153,880	294,302
Net Investment income (loss)	169,634	2,955,455	1,283,867	(6,448)	81,089	110,997	(153,880)	(294,302)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(467,185)	(2,866,814)	(1,394,378)	11,168	(16,767)	(127,733)	572,711	341,943
Realized gain distribution	3,537,920	-	-	-	-	-	983,474	1,707,712
Realized gain (loss)	3,070,735	(2,866,814)	(1,394,378)	11,168	(16,767)	(127,733)	1,556,185	2,049,655
Change in net unrealized appreciation/depreciation of investments	(1,295,894)	3,379,201	1,605,287	1,332,707	1,047,039	4,443,400	4,114,460	7,120,537
Net gain (loss) on investments	1,774,841	512,387	210,909	1,343,875	1,030,272	4,315,667	5,670,645	9,170,192
Net increase (decrease) in net assets resulting from operations	1,944,475	3,467,842	1,494,776	1,337,427	1,111,361	4,426,664	5,516,765	8,875,890
Capital transactions:								
Transfers of net premiums	1,158,964	466,330	1,600,054	634,263	6,390,304	15,331,247	102,757	1,834,772
Transfers due to death benefits	(221,361)	(1,726,456)	(283,744)	(36,853)	(19,297)	-	(99,060)	(194,404)
Transfers due to annuity benefit payments	-	(298,644)	(476)	-	-	-	(10,925)	-
Transfers due to withdrawal of funds	(2,909,361)	(10,882,635)	(4,766,688)	(597,355)	(61,201)	(119,531)	(2,002,259)	(1,347,495)
Transfers due to loans, net of repayments	-	1,538	-	(6,073)	-	-	2,940	-
Transfers due to charges for administrative and insurance costs	(28,189)	(377,307)	(137,593)	349	-	-	(12,271)	(6,291)
Transfers due to contingent deferred sales charges	(4,035)	(28)	(24,129)	(3,210)	(96,060)	(383,160)	(169)	(4,975)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	69,863	55	-	-	-	3,506	-
Transfers between Sub-Accounts and to/from General Account	(123,117)	6,526,597	(878,968)	568,730	101,417	71,697	479,115	1,659,722
Net increase (decrease) in net assets resulting from capital transactions	(2,127,099)	(6,220,742)	(4,491,489)	559,851	6,315,163	14,900,253	(1,536,366)	1,941,329
Total increase (decrease)	(182,624)	(2,752,900)	(2,996,713)	1,897,278	7,426,524	19,326,917	3,980,399	10,817,219
NET ASSETS, at beginning of the year	28,418,303	88,867,535	43,115,577	7,786,105	5,074,791	18,624,545	11,258,538	17,964,547
NET ASSETS, at end of the year	\$ 28,235,679	\$ 86,114,635	\$ 40,118,864	\$ 9,683,383	\$ 12,501,315	\$ 37,951,462	\$ 15,238,937	\$ 28,781,766

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	MML Managed Bond Sub-Account (Initial Class)	MML Managed Bond Sub-Account (Service Class)	MML Managed Volatility Sub-Account (Initial Class)	MML Managed Volatility Sub-Account (Service Class)	MML Mid Cap Growth Sub-Account (Initial Class)	MML Mid Cap Growth Sub-Account (Service Class)	MML Mid Cap Value Sub-Account (Initial Class)	MML Mid Cap Value Sub-Account (Service Class)
Investment income								
Dividends	\$ 2,963,630	\$ 6,282,117	\$ 364,524	\$ 49,436	\$ -	\$ -	\$ 2,525,730	\$ 1,130,263
Expenses								
Mortality and expense risk fees and administrative charges	937,389	2,163,597	820,846	236,009	695,501	1,063,626	1,210,233	597,366
Net investment income (loss)	2,026,241	4,118,520	(456,322)	(186,573)	(695,501)	(1,063,626)	1,315,497	532,897
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(2,259,706)	(6,460,151)	1,101,466	448,707	(4,699,133)	(10,770,475)	(5,436,318)	(3,410,367)
Realized gain distribution	-	-	11,567,188	3,326,001	-	-	15,168,462	7,571,864
Realized gain (loss)	(2,259,706)	(6,460,151)	12,668,654	3,774,708	(4,699,133)	(10,770,475)	9,732,144	4,161,497
Change in net unrealized appreciation/depreciation of investments	4,039,191	10,551,914	(5,323,343)	(1,644,433)	16,870,232	27,774,668	(6,571,471)	(2,801,158)
Net gain (loss) on investments	1,779,485	4,091,763	7,345,311	2,130,275	12,171,099	17,004,193	3,160,673	1,360,339
Net increase (decrease) in net assets resulting from operations	3,805,726	8,210,283	6,888,989	1,943,702	11,475,598	15,940,567	4,476,170	1,893,236
Capital transactions:								
Transfers of net premiums	526,777	5,379,996	271,092	239,566	480,196	2,366,708	475,172	1,905,884
Transfers due to death benefits	(1,350,522)	(1,916,884)	(843,737)	(103,031)	(1,116,066)	(634,563)	(1,643,817)	(462,320)
Transfers due to annuity benefit payments	(239,871)	(573)	(224,104)	-	(130,362)	-	(306,093)	-
Transfers due to withdrawal of funds	(9,291,686)	(32,918,171)	(7,419,268)	(3,243,762)	(5,300,287)	(10,741,152)	(10,958,098)	(5,800,385)
Transfers due to loans, net of repayments	3,980	-	2,143	-	(8,483)	-	5,411	-
Transfers due to charges for administrative and insurance costs	(248,704)	(864,433)	(311,758)	(87,157)	(74,359)	(155,900)	(327,282)	(105,687)
Transfers due to contingent deferred sales charges	(144)	(21,812)	(255)	-	(1,191)	(11,390)	(1,618)	(6,670)
Transfers due to net charge (credit) to annuitant mortality fluctuation	56,262	66	38,403	-	10,165	-	64,145	-
Transfers between Sub-Accounts and to/from General Account	3,515,356	5,137,420	(437,591)	(665,892)	(1,049,361)	(52,139)	1,353,022	(1,673,506)
Net increase (decrease) in net assets resulting from capital transactions	(7,028,552)	(25,204,391)	(8,925,075)	(3,860,276)	(7,189,748)	(9,228,436)	(11,339,158)	(6,142,684)
Total increase (decrease)	(3,222,826)	(16,994,108)	(2,036,086)	(1,916,574)	4,285,850	6,712,131	(6,862,988)	(4,249,448)
NET ASSETS, at beginning of the year	76,373,788	180,957,384	63,499,565	19,279,858	57,562,324	81,046,753	104,763,063	50,303,554
NET ASSETS, at end of the year	\$ 73,150,962	\$ 163,963,276	\$ 61,463,479	\$ 17,363,284	\$ 61,848,174	\$ 87,758,884	\$ 97,900,075	\$ 46,054,106

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)

For The Year Ended December 31, 2023

	MML Moderate Allocation Sub-Account (Initial Class)	MML Moderate Allocation Sub-Account (Service Class)	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account (Initial Class)	MML Small Cap Equity Sub-Account (Service Class)	MML Small Cap Growth Equity Sub-Account (Initial Class)	MML Small Cap Growth Equity Sub-Account (Service Class)	MML Small Company Value Sub-Account
Investment income								
Dividends	\$ 5,253,921	\$ 29,646,564	\$ 984,089	\$ 274,451	\$ 248,123	\$ -	\$ -	\$ 201,235
Expenses								
Mortality and expense risk fees and administrative charges	1,993,743	12,725,925	361,883	241,920	297,172	782,158	280,537	295,481
Net investment income (loss)	3,260,178	16,920,639	622,206	32,531	(49,049)	(782,158)	(280,537)	(94,246)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(5,585,220)	(52,618,353)	(672,791)	464,368	20,281	(4,934,899)	(2,376,965)	(4,021,572)
Realized gain distribution	15,826,168	98,261,489	-	-	-	-	-	59,615
Realized gain (loss)	10,240,948	45,643,136	(672,791)	464,368	20,281	(4,934,899)	(2,376,965)	(3,961,957)
Change in net unrealized appreciation/depreciation of investments	5,157,005	50,844,336	1,603,135	2,787,104	3,673,532	14,637,404	5,818,332	7,265,882
Net gain (loss) on investments	15,397,953	96,487,472	930,344	3,251,472	3,693,813	9,702,505	3,441,367	3,303,925
Net increase (decrease) in net assets resulting from operations	18,658,131	113,408,111	1,552,550	3,284,003	3,644,764	8,920,347	3,160,830	3,209,679
Capital transactions:								
Transfers of net premiums	813,855	9,986,192	3,389,867	127,153	670,562	1,360,532	489,553	522,810
Transfers due to death benefits	(1,840,512)	(11,199,082)	(148,908)	(244,454)	(241,389)	(748,082)	(530,833)	(236,233)
Transfers due to annuity benefit payments	-	(4,337)	(405)	(26,715)	-	(220,222)	-	-
Transfers due to withdrawal of funds	(17,927,219)	(190,446,381)	(4,105,732)	(2,057,599)	(3,023,135)	(7,043,662)	(2,467,615)	(2,432,589)
Transfers due to loans, net of repayments	26,722	-	-	(1,137)	-	(7,837)	-	6,608
Transfers due to charges for administrative and insurance costs	(1,813,619)	(6,476,116)	484	(21,265)	(31,888)	(263,885)	(41,829)	(19,371)
Transfers due to contingent deferred sales charges	(5)	(20,377)	(6,835)	(386)	(653)	(5,916)	-	(1,588)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	(10,379)	203	6,290	-	34,717	-	-
Transfers between Sub-Accounts and to/from General Account	142,498	(3,711,017)	327,503	(273,289)	657,349	2,024,072	160,783	(415,754)
Net increase (decrease) in net assets resulting from capital transactions	(20,598,280)	(201,881,497)	(543,823)	(2,491,402)	(1,969,154)	(4,870,283)	(2,389,941)	(2,576,117)
Total increase (decrease)	(1,940,149)	(88,473,386)	1,008,727	792,601	1,675,610	4,050,064	770,889	633,562
NET ASSETS, at beginning of the year	161,103,074	1,044,498,635	29,348,995	21,412,816	23,617,332	60,413,373	22,649,920	23,768,684
NET ASSETS, at end of the year	\$159,162,925	\$ 956,025,249	\$ 30,357,722	\$ 22,205,417	\$ 25,292,942	\$ 64,463,437	\$ 23,420,809	\$ 24,402,246

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	MML Small/Mid Cap Value Sub-Account (Initial Class)	MML Small/Mid Cap Value Sub-Account (Service Class)	MML Strategic Emerging Markets Sub-Account	MML Sustainable Equity Sub-Account (Initial Class)	MML Sustainable Equity Sub-Account (Service Class)	MML Total Return Bond Sub-Account	MML U.S. Government Money Market Sub-Account	PIMCO Commodity RealReturn® Strategy Sub-Account
Investment income								
Dividends	\$ 774,841	\$ 199,242	\$ -	\$ 550,710	\$ 324,085	\$ 762,741	\$ 5,525,061	\$ 1,264,216
Expenses								
Mortality and expense risk fees and administrative charges	891,831	292,754	136,622	616,592	596,497	445,938	1,498,253	98,101
Net Investment income (loss)	(116,990)	(93,512)	(136,622)	(65,882)	(272,412)	316,803	4,026,808	1,166,115
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(3,030,369)	(1,310,343)	(2,060,408)	4,524,035	310,967	(1,302,544)	347	(233,858)
Realized gain distribution	8,916,199	3,026,006	-	17,662,152	14,495,443	-	-	-
Realized gain (loss)	5,885,830	1,715,663	(2,060,408)	22,186,187	14,806,410	(1,302,544)	347	(233,858)
Change in net unrealized appreciation/depreciation of investments	4,659,468	1,747,590	3,179,801	(10,157,739)	(4,754,225)	2,373,357	(347)	(1,695,592)
Net gain (loss) on investments	10,545,298	3,463,253	1,119,393	12,028,448	10,052,185	1,070,813	-	(1,929,450)
Net increase (decrease) in net assets resulting from operations	10,428,308	3,369,741	982,771	11,962,566	9,779,773	1,387,616	4,026,808	(763,335)
Capital transactions:								
Transfers of net premiums	335,272	396,123	393,281	282,301	252,745	2,299,122	4,668,859	124,385
Transfers due to death benefits	(802,613)	(183,216)	(33,462)	(554,720)	(230,043)	(394,840)	(2,069,097)	(46,669)
Transfers due to annuity benefit payments	(257,956)	-	-	(44,114)	-	-	(65,843)	(17,750)
Transfers due to withdrawal of funds	(8,173,301)	(2,570,409)	(1,174,257)	(5,644,655)	(5,722,974)	(3,942,575)	(40,519,754)	(967,252)
Transfers due to loans, net of repayments	(3,097)	-	120	(2,602)	-	478	9,672	10,675
Transfers due to charges for administrative and insurance costs	(277,845)	(62,852)	(24,399)	(62,648)	(53,628)	3,752	(170,846)	(38,500)
Transfers due to contingent deferred sales charges	(11)	(3,741)	(2,424)	(385)	(1,012)	(16,769)	(8,280)	(8)
Transfers due to net charge (credit) to annuitant mortality fluctuation	56,728	-	-	20,575	-	-	16,380	5,030
Transfers between Sub-Accounts and to/from General Account	542,311	218,782	117,177	(1,436,070)	(117,308)	1,014,705	19,519,907	(545,666)
Net increase (decrease) in net assets resulting from capital transactions	(8,580,512)	(2,205,313)	(723,964)	(7,442,318)	(5,872,220)	(1,036,127)	(18,619,002)	(1,475,755)
Total increase (decrease)	1,847,796	1,164,428	258,807	4,520,248	3,907,553	351,489	(14,592,194)	(2,239,090)
NET ASSETS, at beginning of the year	72,429,647	23,433,475	10,939,529	55,237,374	46,573,782	35,974,681	131,305,870	9,095,267
NET ASSETS, at end of the year	\$ 74,277,443	\$ 24,597,903	\$ 11,198,336	\$ 59,757,622	\$ 50,481,335	\$ 36,326,170	\$ 116,713,676	\$ 6,856,177

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2023

	PIMCO Income Sub-Account	VY® CBRE Global Real Estate Sub-Account
Investment income		
Dividends	\$ 82,750	\$ 157,412
Expenses		
Mortality and expense risk fees and administrative charges	20,328	110,512
Net investment income (loss)	62,422	46,900
Net realized and unrealized gain (loss) on investments		
Realized gain (loss) on sale of fund shares	(2,034)	(392,710)
Realized gain distribution	-	94,261
Realized gain (loss)	(2,034)	(298,449)
Change in net unrealized appreciation/depreciation of investments	47,958	1,174,809
Net gain (loss) on investments	45,924	876,360
Net increase (decrease) in net assets resulting from operations	108,346	923,260
Capital transactions:		
Transfers of net premiums	1,129,941	96,630
Transfers due to death benefits	-	(30,516)
Transfers due to annuity benefit payments	-	(35,602)
Transfers due to withdrawal of funds	(2,732)	(976,880)
Transfers due to loans, net of repayments	-	685
Transfers due to charges for administrative and insurance costs	-	(47,488)
Transfers due to contingent deferred sales charges	(6,592)	(11)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	10,397
Transfers between Sub-Accounts and to/from General Account	49,912	85,466
Net increase (decrease) in net assets resulting from capital transactions	1,170,529	(897,319)
Total increase (decrease)	1,278,875	25,941
NET ASSETS, at beginning of the year	835,304	9,135,382
NET ASSETS, at end of the year	\$ 2,114,179	\$ 9,161,323

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

**STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS
For The Year Ended December 31, 2022**

	BlackRock 60/40 Target Allocation ETF V.I. Sub-Account (Class III)	Delaware Ivy VIP Asset Strategy Sub-Account (Class II)	Fidelity® VIP Contrafund® Sub-Account (Initial Class)	Fidelity® VIP Contrafund® Sub-Account (Service Class 2)	Fidelity® VIP Healthcare Sub-Account	Fidelity® VIP Real Estate Sub-Account	Fidelity® VIP Strategic Income Sub-Account	Invesco Oppenheimer V.I. International Growth Sub-Account (Series I)
Investment income								
Dividends	\$ 320,512	\$ 179,708	\$ 950,970	\$ 563,283	\$ -	\$ 1,940	\$ 7,277	\$ -
Expenses								
Mortality and expense risk fees and administrative charges	170,295	148,246	2,361,541	2,757,795	2,611	1,194	1,160	256,255
Net Investment income (loss)	150,217	31,462	(1,410,571)	(2,194,512)	(2,611)	746	6,117	(256,255)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	28,994	(82,769)	8,181,837	6,018,068	(1,485)	(1,144)	(963)	(269,507)
Realized gain distribution	5,391	905,928	9,053,292	10,647,705	-	-	-	4,027,371
Realized gain (loss)	34,385	823,159	17,235,129	16,665,773	(1,485)	(1,144)	(963)	3,757,864
Change in net unrealized appreciation/depreciation of investments	(3,156,743)	(2,946,196)	(82,508,846)	(90,565,756)	2,501	(30,728)	(8,854)	(11,532,497)
Net gain (loss) on investments	(3,122,358)	(2,123,037)	(65,273,717)	(73,899,983)	1,016	(31,872)	(9,817)	(7,774,633)
Net increase (decrease) in net assets resulting from operations	(2,972,141)	(2,091,575)	(66,684,288)	(76,094,495)	(1,595)	(31,126)	(3,700)	(8,030,888)
Capital transactions:								
Transfers of net premiums	1,698,829	592,631	1,251,792	9,772,320	461,484	182,862	214,580	195,720
Transfers due to death benefits	(33,215)	(95,423)	(2,344,813)	(1,432,762)	(4,198)	(3,795)	-	(104,352)
Transfers due to annuity benefit payments	-	-	(680,190)	(409)	-	-	-	(73,728)
Transfers due to withdrawal of funds	(553,451)	(897,868)	(17,623,733)	(18,120,816)	(601)	(291)	(219)	(1,386,146)
Transfers due to loans, net of repayments	-	-	(11,411)	-	-	-	-	(4,339)
Transfers due to cost of insurance	-	2,639	(480,267)	(152,366)	-	-	-	(84,985)
Transfers due to contingent deferred sales charges	-	(628)	(1,033)	(5,558)	(936)	(389)	(1,063)	(218)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	-	122,880	42	-	-	-	27,512
Transfers between Sub-Accounts and to/from General Account	(245,515)	17,771	3,989,314	(1,353,734)	(7,127)	4,964	(8,455)	1,021,878
Net increase (decrease) in net assets resulting from capital transactions	866,648	(380,878)	(15,777,461)	(11,293,283)	448,622	183,351	204,843	(408,658)
Total increase (decrease)	(2,105,493)	(2,472,453)	(82,461,749)	(87,387,778)	447,027	152,225	201,143	(8,439,546)
NET ASSETS, at beginning of the year	18,530,683	13,346,595	250,765,962	279,055,343	-	-	-	28,738,025
NET ASSETS, at end of the year	\$ 16,425,190	\$ 10,874,142	\$ 168,304,213	\$ 191,667,565	\$ 447,027	\$ 152,225	\$ 201,143	\$ 20,298,479

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)

For The Year Ended December 31, 2022

	Invesco Oppenheimer V.I. International Growth Sub-Account (Series II)	Invesco V.I. Capital Appreciation Sub-Account (Series I)	Invesco V.I. Capital Appreciation Sub-Account (Series II)	Invesco V.I. Conservative Balanced Sub-Account (Series I)	Invesco V.I. Conservative Balanced Sub-Account (Series II)	Invesco V.I. Core Plus Bond Sub-Account	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series I)	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series II)
Investment income								
Dividends	\$ -	\$ -	\$ -	\$ 79,929	\$ 566	\$ 60,700	\$ -	\$ -
Expenses								
Mortality and expense risk fees and administrative charges	241,752	1,523,565	122,507	66,742	565	20,118	1,015,239	322,211
Net Investment income (loss)	(241,752)	(1,523,565)	(122,507)	13,187	1	40,582	(1,015,239)	(322,211)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(339,301)	2,207,214	369,000	214,251	402	(4,666)	244,767	(93,794)
Realized gain distribution	3,501,346	42,264,421	3,118,548	435,543	3,740	928	21,561,207	7,714,901
Realized gain (loss)	3,162,045	44,471,635	3,487,548	649,794	4,142	(3,738)	21,805,974	7,621,107
Change in net unrealized appreciation/depreciation of investments	(10,105,086)	(93,017,304)	(7,392,458)	(1,879,814)	(14,325)	(301,045)	(54,795,681)	(18,346,399)
Net gain (loss) on investments	(6,943,041)	(48,545,669)	(3,904,910)	(1,230,020)	(10,183)	(304,783)	(32,989,707)	(10,725,292)
Net increase (decrease) in net assets resulting from operations	(7,184,793)	(50,069,234)	(4,027,417)	(1,216,833)	(10,182)	(264,201)	(34,004,946)	(11,047,503)
Capital transactions:								
Transfers of net premiums	523,653	468,903	114,707	8,403	-	-	389,143	1,358,389
Transfers due to death benefits	(251,788)	(1,686,703)	(63,592)	(79,482)	-	(10,439)	(868,892)	(91,024)
Transfers due to annuity benefit payments	-	(313,102)	-	(6,080)	-	(45)	(242,681)	(191)
Transfers due to withdrawal of funds	(1,930,305)	(13,256,465)	(1,463,496)	(333,546)	(1,153)	(77,940)	(8,170,233)	(1,822,620)
Transfers due to loans, net of repayments	-	7,648	-	(235)	-	-	(9,893)	-
Transfers due to cost of insurance	(70,497)	(384,997)	(15,247)	(4,758)	46	-	(266,240)	(11,316)
Transfers due to contingent deferred sales charges	(577)	(436)	-	(49)	-	(28)	(136)	(346)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	44,148	-	529	-	10	35,692	20
Transfers between Sub-Accounts and to/from General Account	1,713,598	7,280,226	(632,089)	(16,793)	-	-	6,805,582	128,577
Net increase (decrease) in net assets resulting from capital transactions	(15,916)	(7,840,778)	(2,059,717)	(432,011)	(1,107)	(88,442)	(2,327,658)	(438,511)
Total increase (decrease)	(7,200,709)	(57,910,012)	(6,087,134)	(1,648,844)	(11,289)	(352,643)	(36,332,604)	(11,486,014)
NET ASSETS, at beginning of the year	26,049,458	161,466,451	13,493,003	6,987,321	56,716	1,772,416	105,647,787	34,332,308
NET ASSETS, at end of the year	\$ 18,848,749	\$103,556,439	\$ 7,405,869	\$ 5,338,477	\$ 45,427	\$ 1,419,773	\$ 69,315,183	\$ 22,846,294

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2022

	Invesco V.I. Diversified Dividend Sub-Account (Series I)	Invesco V.I. Diversified Dividend Sub-Account (Series II)	Invesco V.I. Global Sub-Account (Series I)	Invesco V.I. Global Sub-Account (Series II)	Invesco V.I. Global Strategic Income Sub-Account (Series I)	Invesco V.I. Global Strategic Income Sub-Account (Series II)	Invesco V.I. Health Care Sub-Account (Series I)	Invesco V.I. Health Care Sub-Account (Series II)
Investment income								
Dividends	\$ 88,923	\$ 165,443	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Expenses								
Mortality and expense risk fees and administrative charges	56,165	138,284	1,587,882	717,701	1,492,984	599,892	108,183	120,049
Net Investment income (loss)	32,758	27,159	(1,587,882)	(717,701)	(1,492,984)	(599,892)	(108,183)	(120,049)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	51,389	92,077	2,676,058	467,643	(6,074,013)	(2,340,498)	5,215	69,809
Realized gain distribution	583,379	1,251,212	22,633,364	9,776,023	-	-	1,265,290	1,357,316
Realized gain (loss)	634,768	1,343,289	25,309,422	10,243,666	(6,074,013)	(2,340,498)	1,270,505	1,427,125
Change in net unrealized appreciation/depreciation of investments	(802,461)	(1,749,671)	(80,778,404)	(34,677,208)	(10,232,913)	(4,356,125)	(2,800,020)	(3,027,263)
Net gain (loss) on investments	(167,693)	(406,382)	(55,468,982)	(24,433,542)	(16,306,926)	(6,696,623)	(1,529,515)	(1,600,138)
Net increase (decrease) in net assets resulting from operations	(134,935)	(379,223)	(57,056,864)	(25,151,243)	(17,799,910)	(7,296,515)	(1,637,698)	(1,720,187)
Capital transactions:								
Transfers of net premiums	82,504	207,911	820,458	1,324,053	660,589	652,640	122,963	142,016
Transfers due to death benefits	(73,015)	(8,473)	(1,714,520)	(197,068)	(1,902,074)	(503,591)	(126,244)	(56,901)
Transfers due to annuity benefit payments	(18,401)	-	(322,198)	(412)	(331,195)	-	(41,064)	-
Transfers due to withdrawal of funds	(269,885)	(2,015,348)	(12,764,595)	(6,379,593)	(12,200,177)	(4,279,835)	(762,707)	(1,365,653)
Transfers due to loans, net of repayments	(7,276)	-	9,864	-	682	-	4,199	-
Transfers due to cost of insurance	(8,672)	(3,965)	(322,603)	(127,030)	(481,356)	(294,741)	(9,547)	(12,934)
Transfers due to contingent deferred sales charges	(3)	-	(611)	(94)	(451)	-	(176)	-
Transfers due to net charge (credit) to annuitant mortality fluctuation	3,252	-	73,696	43	58,221	-	10,694	-
Transfers between Sub-Accounts and to/from General Account	110,250	343,749	11,145,889	2,483,654	(5,810,127)	(2,698,820)	35,897	(42,685)
Net increase (decrease) in net assets resulting from capital transactions	(181,246)	(1,476,126)	(3,074,620)	(2,896,447)	(20,005,888)	(7,124,347)	(765,985)	(1,336,157)
Total increase (decrease)	(316,181)	(1,855,349)	(60,131,484)	(28,047,690)	(37,805,798)	(14,420,862)	(2,403,683)	(3,056,344)
NET ASSETS, at beginning of the year	4,919,882	11,345,055	176,055,227	77,475,203	143,423,120	57,328,981	11,396,798	11,700,675
NET ASSETS, at end of the year	\$ 4,603,701	\$ 9,489,706	\$ 115,923,743	\$ 49,427,513	\$ 105,617,322	\$ 42,908,119	\$ 8,993,115	\$ 8,644,331

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)

For The Year Ended December 31, 2022

	Invesco V.I. Main Street Sub-Account (Series I)	Invesco V.I. Main Street Sub-Account (Series II)	Invesco V.I. Technology Sub-Account (Series I)	Invesco V.I. Technology Sub-Account (Series II)	Invesco V.I. U.S. Government Money Sub-Account	Janus Henderson Global Technology and Innovation Sub-Account	MML Aggressive Allocation Sub-Account (Initial Class)	MML Aggressive Allocation Sub-Account (Service Class)
Investment income								
Dividends	\$ 435,222	\$ 231,685	\$ -	\$ -	\$ 85,981	\$ -	\$ 587,102	\$ 1,423,938
Expenses								
Mortality and expense risk fees and administrative charges	337,050	262,495	79,194	113,307	72,458	1,494	344,553	965,479
Net Investment income (loss)	98,172	(30,810)	(79,194)	(113,307)	13,523	(1,494)	242,549	458,459
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(108,049)	(337,549)	207,322	(326,480)	-	(4,731)	210,985	(1,458,792)
Realized gain distribution	11,217,934	8,051,790	2,503,407	3,389,938	-	22,771	3,975,094	11,286,908
Realized gain (loss)	11,109,885	7,714,241	2,710,729	3,063,458	-	18,040	4,186,079	9,828,116
Change in net unrealized appreciation/depreciation of investments	(18,859,727)	(13,170,083)	(6,518,315)	(7,963,463)	-	(52,224)	(10,319,199)	(26,573,983)
Net gain (loss) on investments	(7,749,842)	(5,455,842)	(3,807,586)	(4,900,005)	-	(34,184)	(6,133,120)	(16,745,867)
Net increase (decrease) in net assets resulting from operations	(7,651,670)	(5,486,652)	(3,886,780)	(5,013,312)	13,523	(35,678)	(5,890,571)	(16,287,408)
Capital transactions:								
Transfers of net premiums	95,091	577,796	125,143	70,220	113,229	277,453	529,391	1,502,980
Transfers due to death benefits	(424,954)	(62,055)	(157,069)	(62,194)	(25,747)	-	(234,782)	(44,841)
Transfers due to annuity benefit payments	(20,387)	-	(20,140)	(184)	(8,132)	-	-	-
Transfers due to withdrawal of funds	(1,853,203)	(1,859,977)	(480,941)	(1,167,284)	(626,152)	(275)	(4,220,255)	(10,815,755)
Transfers due to loans, net of repayments	(3,851)	-	154	-	133	-	(8,306)	-
Transfers due to cost of insurance	(20,923)	(2,542)	(8,661)	(3,116)	23,089	-	(92,688)	(92,676)
Transfers due to contingent deferred sales charges	(343)	-	(93)	-	(149)	(547)	(5)	-
Transfers due to net charge (credit) to annuitant mortality fluctuation	934	-	8,975	19	1,887	-	-	-
Transfers between Sub-Accounts and to/from General Account	(440,303)	(530,438)	(4,996)	(122,803)	1,397,356	3,776	53,868	(842,632)
Net increase (decrease) in net assets resulting from capital transactions	(2,667,939)	(1,877,216)	(537,628)	(1,285,342)	875,514	280,407	(3,972,777)	(10,292,924)
Total increase (decrease)	(10,319,609)	(7,363,868)	(4,424,408)	(6,298,654)	889,037	244,729	(9,863,348)	(26,580,332)
NET ASSETS, at beginning of the year	37,181,449	26,323,196	9,838,777	12,810,416	5,812,814	-	36,316,920	95,058,178
NET ASSETS, at end of the year	\$ 26,861,840	\$ 18,959,328	\$ 5,414,369	\$ 6,511,762	\$ 6,701,851	\$ 244,729	\$ 26,453,572	\$ 68,477,846

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2022

	MML American Funds Core Allocation Sub-Account	MML American Funds Growth Sub-Account	MML American Funds International Sub-Account	MML Balanced Allocation Sub-Account (Initial Class)	MML Balanced Allocation Sub-Account (Service Class)	MML Blend Sub-Account (Initial Class)	MML Blend Sub-Account (Service Class)	MML Blue Chip Growth Sub-Account (Initial Class)
Investment income								
Dividends	\$ 16,292,698	\$ 938,241	\$ 7,469,097	\$ 2,357,662	\$ 10,095,633	\$ 773,236	\$ 2,126,739	\$ -
Expenses								
Mortality and expense risk fees and administrative charges	9,997,557	2,752,809	490,764	853,829	3,875,238	693,771	2,399,426	548,391
Net Investment income (loss)	6,295,141	(1,814,568)	6,978,333	1,503,833	6,220,395	79,465	(272,687)	(548,391)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(11,274,379)	4,181,111	(19,713,164)	(512,630)	(5,266,691)	(1,475,511)	(6,106,369)	190,183
Realized gain distribution	50,493,008	48,180,028	1,038,955	4,593,925	21,485,501	1,035,412	3,532,153	8,224,405
Realized gain (loss)	39,218,629	52,361,139	(18,674,209)	4,081,295	16,218,810	(440,099)	(2,574,216)	8,414,588
Change in net unrealized appreciation/depreciation of investments	(178,198,783)	(137,680,141)	(3,430,385)	(17,723,177)	(79,262,906)	(11,414,506)	(36,424,621)	(33,927,687)
Net gain (loss) on investments	(138,980,154)	(85,319,002)	(22,104,594)	(13,641,882)	(63,044,096)	(11,854,605)	(38,998,837)	(25,513,099)
Net increase (decrease) in net assets resulting from operations	(132,685,013)	(87,133,570)	(15,126,261)	(12,138,049)	(56,823,701)	(11,775,140)	(39,271,524)	(26,061,490)
Capital transactions:								
Transfers of net premiums	14,724,366	10,520,931	878,369	536,870	8,035,321	394,293	13,607,936	314,456
Transfers due to death benefits	(5,137,564)	(1,495,031)	(234,432)	(745,021)	(3,213,335)	(682,408)	(1,427,476)	(363,818)
Transfers due to annuity benefit payments	(36,194)	(21,427)	-	-	(8,186)	(213,240)	-	(94,703)
Transfers due to withdrawal of funds	(91,370,924)	(20,695,044)	(3,043,411)	(7,082,083)	(37,134,145)	(5,147,904)	(12,776,660)	(3,826,384)
Transfers due to loans, net of repayments	12,554	(1,626)	1,972	4,205	-	(8,861)	-	(13,951)
Transfers due to cost of insurance	(5,565,329)	(413,955)	(204,303)	(471,409)	(1,252,274)	(62,294)	(42,804)	(59,283)
Transfers due to contingent deferred sales charges	(16,616)	(8,187)	(841)	-	-	(741)	(2,476)	(385)
Transfers due to net charge (credit) to annuitant mortality fluctuation	7,132	2,357	-	-	804	40,192	-	30,206
Transfers between Sub-Accounts and to/from General Account	(6,227,813)	3,741,160	(39,863,815)	(425,722)	(5,332,079)	(228,539)	(4,863,694)	159,913
Net increase (decrease) in net assets resulting from capital transactions	(93,610,388)	(8,370,822)	(42,466,461)	(8,183,160)	(38,903,894)	(5,909,502)	(5,505,174)	(3,853,949)
Total increase (decrease)	(226,295,401)	(95,504,392)	(57,592,722)	(20,321,209)	(95,727,595)	(17,684,642)	(44,776,698)	(29,915,439)
NET ASSETS, at beginning of the year	919,106,679	282,628,214	57,592,722	78,951,185	363,104,191	68,982,917	217,290,953	66,935,027
NET ASSETS, at end of the year	\$ 692,811,278	\$ 187,123,822	\$ -	\$ 58,629,976	\$ 267,376,596	\$ 51,298,275	\$ 172,514,255	\$ 37,019,588

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2022

	MML Blue Chip Growth Sub-Account (Service Class)	MML Conservative Allocation Sub-Account (Initial Class)	MML Conservative Allocation Sub-Account (Service Class)	MML Dynamic Bond Sub-Account (Service Class I)	MML Equity Sub-Account (Initial Class)	MML Equity Sub-Account (Service Class)	MML Equity Income Sub-Account (Initial Class)	MML Equity Income Sub-Account (Service Class)
Investment income								
Dividends	\$ -	\$ 2,193,895	\$ 9,438,491	\$ 445,452	\$ 371,569	\$ 1,250,749	\$ 2,092,308	\$ 1,245,550
Expenses								
Mortality and expense risk fees and administrative charges	1,839,523	699,395	3,419,660	149,876	285,407	1,181,581	1,556,637	1,051,021
Net Investment income (loss)	(1,839,523)	1,494,500	6,018,831	295,576	86,162	69,168	535,671	194,529
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(4,232,177)	(591,943)	(4,217,391)	(153,673)	357,380	(11,168)	1,008,497	(570,411)
Realized gain distribution	27,920,807	4,624,225	21,589,285	-	2,483,756	10,101,366	16,328,982	11,451,665
Realized gain (loss)	23,688,630	4,032,282	17,371,894	(153,673)	2,841,136	10,090,198	17,337,479	10,881,254
Change in net unrealized appreciation/depreciation of investments	(103,168,053)	(15,805,406)	(72,053,206)	(2,244,985)	(4,427,572)	(16,584,726)	(24,040,052)	(15,423,353)
Net gain (loss) on investments	(79,479,423)	(11,773,124)	(54,681,312)	(2,398,658)	(1,586,436)	(6,494,528)	(6,702,573)	(4,542,099)
Net increase (decrease) in net assets resulting from operations	(81,318,946)	(10,278,624)	(48,662,481)	(2,103,082)	(1,500,274)	(6,425,360)	(6,166,902)	(4,347,570)
Capital transactions:								
Transfers of net premiums	5,737,759	938,395	3,048,920	1,197,859	237,774	2,460,298	636,870	2,185,476
Transfers due to death benefits	(890,897)	(1,436,013)	(4,145,456)	(92,068)	(172,362)	(980,439)	(1,650,240)	(505,839)
Transfers due to annuity benefit payments	(517)	(15,449)	(2,888)	-	(67,528)	-	(362,440)	(610)
Transfers due to withdrawal of funds	(10,517,008)	(5,713,904)	(36,917,918)	(618,990)	(1,767,949)	(9,972,143)	(12,959,583)	(7,812,330)
Transfers due to loans, net of repayments	-	357	-	-	6,803	-	3,424	-
Transfers due to cost of insurance	(51,297)	(422,114)	(1,142,599)	-	(52,631)	(308,806)	(424,915)	(384,734)
Transfers due to contingent deferred sales charges	(9,018)	(9)	(200)	(2,267)	(158)	(199)	(222)	(1,675)
Transfers due to net charge (credit) to annuitant mortality fluctuation	53	3,119	(11,579)	-	33,902	-	89,591	62
Transfers between Sub-Accounts and to/from General Account	(255,553)	2,033,996	6,212,807	(62,687)	428,163	(2,543,995)	(11,815,196)	666,121
Net increase (decrease) in net assets resulting from capital transactions	(5,986,478)	(4,611,622)	(32,958,913)	421,847	(1,353,986)	(11,345,284)	(26,482,711)	(5,853,529)
Total increase (decrease)	(87,305,424)	(14,890,246)	(81,621,394)	(1,681,235)	(2,854,260)	(17,770,644)	(32,649,613)	(10,201,099)
NET ASSETS, at beginning of the year	203,462,318	65,736,943	314,438,147	13,575,976	25,600,018	104,959,878	145,517,882	88,613,015
NET ASSETS, at end of the year	\$ 116,156,894	\$ 50,846,697	\$ 232,816,753	\$ 11,894,741	\$ 22,745,758	\$ 87,189,234	\$ 112,868,269	\$ 78,411,916

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2022

	MML Equity Index Sub-Account (Class I)	MML Equity Index Sub-Account (Service Class I)	MML Equity Momentum Sub-Account (Service Class I)	MML Equity Rotation Sub-Account (Service Class I)	MML Focused Equity Sub-Account	MML Foreign Sub-Account (Initial Class)	MML Foreign Sub-Account (Service Class)	MML Fundamental Equity Sub-Account
Investment income								
Dividends	\$ 312,763	\$ 282,087	\$ 9,607	\$ -	\$ 130,936	\$ 3,468,489	\$ 236,272	\$ 73,760
Expenses								
Mortality and expense risk fees and administrative charges	394,588	445,629	14,570	19,978	254,837	1,210,321	88,584	255,297
Net Investment income (loss)	(81,825)	(163,542)	(4,963)	(19,978)	(123,901)	2,258,168	147,688	(181,537)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	588,121	538,021	(391,327)	(53,862)	827,892	(796,212)	(44,738)	(457,468)
Realized gain distribution	1,839,889	2,246,951	-	219,825	1,660,896	6,461,151	479,118	3,456,380
Realized gain (loss)	2,428,010	2,784,972	(391,327)	165,963	2,488,788	5,664,939	434,380	2,998,912
Change in net unrealized appreciation/depreciation of investments	(9,504,297)	(11,119,540)	108,143	(520,198)	(3,697,730)	(24,860,390)	(1,690,038)	(8,057,419)
Net gain (loss) on investments	(7,076,287)	(8,334,568)	(283,184)	(354,235)	(1,208,942)	(19,195,451)	(1,255,658)	(5,058,507)
Net increase (decrease) in net assets resulting from operations	(7,158,112)	(8,498,110)	(288,147)	(374,213)	(1,332,843)	(16,937,283)	(1,107,970)	(5,240,044)
Capital transactions:								
Transfers of net premiums	342,363	138,296	152,614	111,285	1,412,105	350,653	33,911	1,503,370
Transfers due to death benefits	(429,799)	(42,297)	(6,574)	(94,805)	(75,414)	(997,738)	(71,914)	(19,125)
Transfers due to annuity benefit payments	(321,722)	-	-	-	-	(320,546)	-	(9,659)
Transfers due to withdrawal of funds	(2,242,436)	(6,329,183)	(419,637)	(248,331)	(1,662,916)	(10,316,763)	(618,001)	(1,522,874)
Transfers due to loans, net of repayments	(39,386)	-	-	-	-	1,779	-	-
Transfers due to cost of insurance	(20,167)	(106,479)	-	-	31	(387,361)	(26,619)	(1,122)
Transfers due to contingent deferred sales charges	(264)	-	(215)	(214)	(1,267)	(48)	(20)	(158)
Transfers due to net charge (credit) to annuitant mortality fluctuation	(95,127)	-	-	-	-	59,354	-	1,740
Transfers between Sub-Accounts and to/from General Account	(249,845)	(1,697,624)	(1,599,775)	(14,262)	1,154,023	2,405,390	2,548,341	48,705
Net increase (decrease) in net assets resulting from capital transactions	(3,056,383)	(8,037,287)	(1,873,587)	(246,327)	826,562	(9,205,280)	1,865,698	877
Total increase (decrease)	(10,214,495)	(16,535,397)	(2,161,734)	(620,540)	(506,281)	(26,142,563)	757,728	(5,239,167)
NET ASSETS, at beginning of the year	38,036,347	46,175,143	2,161,734	2,484,746	22,092,990	115,578,289	8,065,680	23,979,880
NET ASSETS, at end of the year	\$ 27,821,852	\$ 29,639,746	\$ -	\$ 1,864,206	\$ 21,586,709	\$ 89,435,726	\$ 8,823,408	\$ 18,740,713

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2022

	MML Fundamental Value Sub-Account	MML Global Sub-Account (Class I)	MML Global Sub-Account (Class II)	MML Global Sub-Account (Service Class I)	MML Growth Allocation Sub-Account (Initial Class)	MML Growth Allocation Sub-Account (Service Class)	MML High Yield Sub-Account	MML Income & Growth Sub-Account (Initial Class)
Investment income								
Dividends	\$ 171,934	\$ 61,331	\$ 67,416	\$ 226,353	\$ 8,230,410	\$ 15,113,854	\$ 3,012,613	\$ 316,198
Expenses								
Mortality and expense risk fees and administrative charges	252,383	48,057	52,602	215,115	4,017,053	7,806,650	515,207	256,290
Net investment income (loss)	(80,449)	13,274	14,814	11,238	4,213,357	7,307,204	2,497,406	59,908
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(580,697)	(241,946)	(167,340)	(1,422,941)	(4,224,664)	(10,584,026)	(1,087,332)	162,190
Realized gain distribution	3,693,954	2,681,213	2,537,527	10,270,001	34,015,506	70,506,702	-	2,407,045
Realized gain (loss)	3,113,257	2,439,267	2,370,187	8,847,061	29,790,842	59,922,677	(1,087,332)	2,569,235
Change in net unrealized appreciation/depreciation of investments	(4,387,722)	(3,390,765)	(3,304,604)	(12,235,088)	(94,165,932)	(189,978,162)	(7,554,326)	(3,013,042)
Net gain (loss) on investments	(1,274,465)	(951,498)	(934,417)	(3,388,028)	(64,375,090)	(130,055,486)	(8,641,658)	(443,807)
Net increase (decrease) in net assets resulting from operations	(1,354,914)	(938,224)	(919,603)	(3,376,790)	(60,161,733)	(122,748,282)	(6,144,252)	(383,899)
Capital transactions:								
Transfers of net premiums	1,744,339	9,934	47,682	586,834	3,019,271	12,447,825	1,912,837	184,774
Transfers due to death benefits	(36,064)	(9,980)	(88,816)	(63,604)	(1,949,590)	(4,386,708)	(594,927)	(263,310)
Transfers due to annuity benefit payments	-	(35,242)	(32)	-	-	-	(526)	(93,947)
Transfers due to withdrawal of funds	(1,827,771)	(292,069)	(135,075)	(1,516,864)	(22,768,729)	(61,585,836)	(4,366,581)	(1,270,856)
Transfers due to loans, net of repayments	(567)	-	(13,098)	-	(4,499)	-	(6,809)	(1,373)
Transfers due to cost of insurance	580	(15,977)	-	(45,246)	(4,017,555)	(6,055,687)	3,471	(32,860)
Transfers due to contingent deferred sales charges	(1,199)	-	(105)	(417)	(211)	(8,169)	(194)	(369)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	14,216	5	-	-	-	268	32,355
Transfers between Sub-Accounts and to/from General Account	1,585,735	236,412	107,967	4,580,100	(6,032,187)	2,543,394	(1,388,712)	(521,974)
Net increase (decrease) in net assets resulting from capital transactions	1,465,053	(92,706)	(81,472)	3,540,803	(31,753,500)	(57,045,181)	(4,441,173)	(1,967,560)
Total increase (decrease)	110,139	(1,030,930)	(1,001,075)	164,013	(91,915,233)	(179,793,463)	(10,585,425)	(2,351,459)
NET ASSETS, at beginning of the year	20,520,581	5,128,057	4,977,478	19,462,328	373,971,831	763,512,275	48,073,933	23,466,564
NET ASSETS, at end of the year	\$ 20,630,720	\$ 4,097,127	\$ 3,976,403	\$ 19,626,341	\$ 282,056,598	\$ 583,718,812	\$ 37,488,508	\$ 21,115,105

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2022

	MML Income & Growth Sub-Account (Service Class)	MML Inflation- Protected and Income Sub-Account (Initial Class)	MML Inflation- Protected and Income Sub-Account (Service Class)	MML International Equity Sub-Account	MML iShares 60/40 Allocation Sub-Account	MML iShares 80/20 Allocation Sub-Account	MML Large Cap Growth Sub-Account (Initial Class)	MML Large Cap Growth Sub-Account (Service Class)
Investment income								
Dividends	\$ 359,104	\$ 2,644,118	\$ 1,162,237	\$ 61,536	\$ 78,194	\$ 254,629	\$ -	\$ -
Expenses								
Mortality and expense risk fees and administrative charges	371,680	1,363,701	614,274	87,560	38,678	129,739	142,941	260,621
Net Investment income (loss)	(12,576)	1,280,417	547,963	(26,024)	39,516	124,890	(142,941)	(260,621)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(196,524)	(1,054,347)	(412,746)	(231,361)	(12,439)	(78,108)	220,283	(26,054)
Realized gain distribution	3,306,589	7,434,466	3,610,305	374,357	-	-	1,281,549	2,077,210
Realized gain (loss)	3,110,065	6,380,119	3,197,559	142,996	(12,439)	(78,108)	1,501,832	2,051,156
Change in net unrealized appreciation/depreciation of investments	(3,778,763)	(24,621,003)	(11,525,229)	(1,430,412)	(350,356)	(1,185,921)	(6,186,619)	(9,191,691)
Net gain (loss) on investments	(668,698)	(18,240,884)	(8,327,670)	(1,287,416)	(362,795)	(1,264,029)	(4,684,787)	(7,140,535)
Net increase (decrease) in net assets resulting from operations	(681,274)	(16,960,467)	(7,779,707)	(1,313,440)	(323,279)	(1,139,139)	(4,827,728)	(7,401,156)
Capital transactions:								
Transfers of net premiums	927,083	512,293	3,846,674	656,848	5,453,085	19,920,614	135,556	1,007,276
Transfers due to death benefits	(392,720)	(2,039,691)	(503,146)	(244,317)	-	(7,546)	(77,601)	(128,139)
Transfers due to annuity benefit payments	-	(335,105)	(521)	-	-	-	(13,439)	-
Transfers due to withdrawal of funds	(2,218,417)	(11,985,993)	(4,762,961)	(530,771)	(25,786)	(30,118)	(1,216,920)	(1,386,466)
Transfers due to loans, net of repayments	-	7,025	-	-	-	-	(12,163)	-
Transfers due to cost of insurance	(34,753)	(397,333)	(140,414)	42	-	-	(13,164)	(5,324)
Transfers due to contingent deferred sales charges	(817)	(30)	(8,707)	(828)	(29,230)	(119,060)	(188)	(1,254)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	59,992	53	-	-	-	3,165	-
Transfers between Sub-Accounts and to/from General Account	(742,522)	(6,902,058)	(531,613)	910,659	1	(206)	(375,337)	(18,476)
Net increase (decrease) in net assets resulting from capital transactions	(2,462,146)	(21,080,900)	(2,100,635)	791,633	5,398,070	19,763,684	(1,570,091)	(532,383)
Total increase (decrease)	(3,143,420)	(38,041,367)	(9,880,342)	(521,807)	5,074,791	18,624,545	(6,397,819)	(7,933,539)
NET ASSETS, at beginning of the year	31,561,723	126,908,902	52,995,919	8,307,912	-	-	17,656,357	25,898,086
NET ASSETS, at end of the year	\$ 28,418,303	\$ 88,867,535	\$ 43,115,577	\$ 7,786,105	\$ 5,074,791	\$ 18,624,545	\$ 11,258,538	\$ 17,964,547

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2022

	MML Managed Bond Sub-Account (Initial Class)	MML Managed Bond Sub-Account (Service Class)	MML Managed Volatility Sub-Account (Initial Class)	MML Managed Volatility Sub-Account (Service Class)	MML Mid Cap Growth Sub-Account (Initial Class)	MML Mid Cap Growth Sub-Account (Service Class)	MML Mid Cap Value Sub-Account (Initial Class)	MML Mid Cap Value Sub-Account (Service Class)
Investment income								
Dividends	\$ 2,643,081	\$ 5,733,205	\$ 343,634	\$ 42,368	\$ -	\$ -	\$ 2,304,580	\$ 983,962
Expenses								
Mortality and expense risk fees and administrative charges	1,104,941	2,655,542	948,437	284,036	745,201	1,150,475	1,422,450	662,622
Net Investment income (loss)	1,538,140	3,077,663	(604,803)	(241,668)	(745,201)	(1,150,475)	882,130	321,340
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(1,730,970)	(4,200,113)	2,623,704	438,459	(2,173,501)	(5,806,409)	975,336	(647,679)
Realized gain distribution	884,421	2,134,336	-	-	18,370,371	28,240,385	26,231,679	12,762,372
Realized gain (loss)	(846,549)	(2,065,777)	2,623,704	438,459	16,196,870	22,433,976	27,207,015	12,114,693
Change in net unrealized appreciation/depreciation of investments	(17,144,311)	(40,677,652)	(13,240,592)	(3,566,863)	(37,274,894)	(52,010,720)	(31,282,493)	(14,012,916)
Net gain (loss) on investments	(17,990,860)	(42,743,429)	(10,616,888)	(3,128,404)	(21,078,024)	(29,576,744)	(4,075,478)	(1,898,223)
Net increase (decrease) in net assets resulting from operations	(16,452,720)	(39,665,766)	(11,221,691)	(3,370,072)	(21,823,225)	(30,727,219)	(3,193,348)	(1,576,883)
Capital transactions:								
Transfers of net premiums	453,722	3,925,281	293,390	461,564	405,726	2,664,210	560,993	1,872,746
Transfers due to death benefits	(1,667,410)	(1,986,200)	(878,869)	(178,602)	(1,019,913)	(777,425)	(1,350,524)	(345,272)
Transfers due to annuity benefit payments	(261,460)	(624)	(238,968)	-	(142,281)	-	(327,606)	-
Transfers due to withdrawal of funds	(9,786,711)	(27,525,374)	(7,637,371)	(2,677,878)	(4,869,980)	(8,433,913)	(10,720,216)	(5,153,559)
Transfers due to loans, net of repayments	8,575	-	5,913	-	4,526	-	(20,067)	-
Transfers due to cost of insurance	(264,314)	(956,131)	(319,924)	(92,069)	(77,401)	(154,415)	(355,240)	(120,348)
Transfers due to contingent deferred sales charges	(158)	(2,958)	(264)	-	(1,231)	(3,506)	(1,617)	(1,274)
Transfers due to net charge (credit) to annuitant mortality fluctuation	69,116	63	29,708	-	31,899	-	66,023	-
Transfers between Sub-Accounts and to/from General Account	(3,155,468)	(6,743,287)	(7,064,152)	(844,896)	(609,927)	326,437	(12,157,851)	(60,179)
Net increase (decrease) in net assets resulting from capital transactions	(14,604,108)	(33,289,230)	(15,810,537)	(3,331,881)	(6,278,582)	(6,378,612)	(24,306,105)	(3,807,886)
Total increase (decrease)	(31,056,828)	(72,954,996)	(27,032,228)	(6,701,953)	(28,101,807)	(37,105,831)	(27,499,453)	(5,384,769)
NET ASSETS, at beginning of the year	107,430,616	253,912,380	90,531,793	25,981,811	85,664,131	118,152,584	132,262,516	55,688,323
NET ASSETS, at end of the year	\$ 76,373,788	\$ 180,957,384	\$ 63,499,565	\$ 19,279,858	\$ 57,562,324	\$ 81,046,753	\$ 104,763,063	\$ 50,303,554

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2022

	MML Moderate Allocation Sub-Account (Initial Class)	MML Moderate Allocation Sub-Account (Service Class)	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account (Initial Class)	MML Small Cap Equity Sub-Account (Service Class)	MML Small Cap Growth Equity Sub-Account (Initial Class)	MML Small Cap Growth Equity Sub-Account (Service Class)	MML Small Company Value Sub-Account
Investment income								
Dividends	\$ 5,839,701	\$ 35,183,820	\$ 924,413	\$ 170,461	\$ 108,874	\$ -	\$ -	\$ -
Expenses								
Mortality and expense risk fees and administrative charges	2,242,005	15,240,729	380,086	271,472	317,307	882,645	324,584	327,432
Net investment income (loss)	3,597,696	19,943,091	544,327	(101,011)	(208,433)	(882,645)	(324,584)	(327,432)
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(2,083,491)	(39,501,884)	(642,556)	653,101	120,647	(4,727,587)	(2,363,800)	(1,878,844)
Realized gain distribution	16,004,361	106,939,391	-	2,853,652	3,044,656	19,915,164	8,085,294	14,125,072
Realized gain (loss)	13,920,870	67,437,507	(642,556)	3,506,753	3,165,303	15,187,577	5,721,494	12,246,228
Change in net unrealized appreciation/depreciation of investments	(50,999,577)	(315,136,382)	(2,978,754)	(8,197,033)	(8,097,183)	(34,947,506)	(13,245,058)	(16,705,438)
Net gain (loss) on investments	(37,078,707)	(247,698,875)	(3,621,310)	(4,690,280)	(4,931,880)	(19,759,929)	(7,523,564)	(4,459,210)
Net increase (decrease) in net assets resulting from operations	(33,481,011)	(227,755,784)	(3,076,983)	(4,791,291)	(5,140,313)	(20,642,574)	(7,848,148)	(4,786,642)
Capital transactions:								
Transfers of net premiums	784,269	15,562,400	1,194,786	136,880	634,123	587,092	1,037,911	691,865
Transfers due to death benefits	(643,371)	(9,374,398)	(327,975)	(150,218)	(106,509)	(808,430)	(181,516)	(187,003)
Transfers due to annuity benefit payments	-	(1,054)	(422)	(27,608)	-	(226,745)	-	-
Transfers due to withdrawal of funds	(18,901,719)	(178,329,361)	(4,659,651)	(2,301,600)	(2,116,782)	(7,326,801)	(2,043,108)	(1,893,834)
Transfers due to loans, net of repayments	27,975	-	-	1,312	-	(3,881)	-	1,422
Transfers due to cost of insurance	(1,818,848)	(6,759,388)	61	(24,407)	(20,452)	(263,332)	(44,280)	(21,059)
Transfers due to contingent deferred sales charges	(5)	(6,284)	(1,520)	(373)	(257)	(1,063)	-	(314)
Transfers due to net charge (credit) to annuitant mortality fluctuation	-	32	212	11,490	-	38,732	-	-
Transfers between Sub-Accounts and to/from General Account	392,545	(9,837,995)	2,194,637	(639,272)	78,306	1,360,397	(935,587)	74,253
Net increase (decrease) in net assets resulting from capital transactions	(20,159,154)	(188,746,048)	(1,599,872)	(2,993,796)	(1,531,571)	(6,644,031)	(2,166,580)	(1,334,670)
Total increase (decrease)	(53,640,165)	(416,501,832)	(4,676,855)	(7,785,087)	(6,671,884)	(27,286,605)	(10,014,728)	(6,121,312)
NET ASSETS, at beginning of the year	214,743,239	1,461,000,467	34,025,850	29,197,903	30,289,216	87,699,978	32,664,648	29,889,996
NET ASSETS, at end of the year	\$161,103,074	\$1,044,498,635	\$ 29,348,995	\$ 21,412,816	\$ 23,617,332	\$ 60,413,373	\$ 22,649,920	\$ 23,768,684

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2022

	MML Small/Mid Cap Value Sub-Account (Initial Class)	MML Small/Mid Cap Value Sub-Account (Service Class)	MML Special Situations Sub-Account (Service Class I)	MML Strategic Emerging Markets Sub-Account (Service Class I)	MML Sustainable Equity Sub-Account (Initial Class)	MML Sustainable Equity Sub-Account (Service Class)	MML Total Return Bond Sub-Account	MML U.S. Government Money Market Sub-Account
Investment income								
Dividends	\$ 1,013,963	\$ 255,938	\$ -	\$ 353,251	\$ 577,250	\$ 351,727	\$ 524,115	\$ 1,411,465
Expenses								
Mortality and expense risk fees and administrative charges	1,030,798	320,170	6,333	146,664	657,155	638,855	494,129	1,241,844
Net Investment income (loss)	(16,835)	(64,232)	(6,333)	206,587	(79,905)	(287,128)	29,986	169,621
Net realized and unrealized gain (loss) on investments								
Realized gain (loss) on sale of fund shares	(1,572,508)	(444,476)	(487,767)	(1,239,663)	5,267,909	1,237,956	(920,383)	374
Realized gain distribution	22,055,964	7,050,264	23,065	3,930,101	8,765,580	7,480,195	-	-
Realized gain (loss)	20,483,456	6,605,788	(464,702)	2,690,438	14,033,489	8,718,151	(920,383)	374
Change in net unrealized appreciation/depreciation of investments	(36,482,132)	(11,583,320)	124,858	(7,222,659)	(26,950,571)	(19,477,341)	(6,323,165)	(373)
Net gain (loss) on investments	(15,998,676)	(4,977,532)	(339,844)	(4,532,221)	(12,917,082)	(10,759,190)	(7,243,548)	1
Net increase (decrease) in net assets resulting from operations	(16,015,511)	(5,041,764)	(346,177)	(4,325,634)	(12,996,987)	(11,046,318)	(7,213,562)	169,622
Capital transactions:								
Transfers of net premiums	436,428	1,041,972	18,686	435,284	375,264	1,260,705	2,622,478	6,447,849
Transfers due to death benefits	(964,540)	(95,929)	-	(119,198)	(1,040,060)	(114,248)	(394,394)	(896,021)
Transfers due to annuity benefit payments	(269,122)	-	-	-	(49,900)	-	-	(67,753)
Transfers due to withdrawal of funds	(8,382,824)	(1,621,556)	(152,965)	(862,395)	(4,572,549)	(2,915,616)	(3,820,645)	(39,500,067)
Transfers due to loans, net of repayments	1,571	-	-	(48)	(3,344)	-	(1,457)	(13,312)
Transfers due to cost of insurance	(284,820)	(58,643)	-	(24,237)	(68,396)	(57,055)	1,955	(25,525)
Transfers due to contingent deferred sales charges	(11)	(1,065)	-	(646)	(368)	(408)	(3,357)	(1,454)
Transfers due to net charge (credit) to annuitant mortality fluctuation	56,239	-	-	-	22,317	-	-	21,660
Transfers between Sub-Accounts and to/from General Account	(1,571,522)	(734,038)	(600,792)	485,392	(1,000,924)	(1,513,288)	(2,613,419)	74,399,116
Net increase (decrease) in net assets resulting from capital transactions	(10,978,601)	(1,469,259)	(735,071)	(85,848)	(6,337,960)	(3,339,910)	(4,208,839)	40,364,493
Total increase (decrease)	(26,994,112)	(6,511,023)	(1,081,248)	(4,411,482)	(19,334,947)	(14,386,228)	(11,422,401)	40,534,115
NET ASSETS, at beginning of the year	99,423,759	29,944,498	1,081,248	15,351,011	74,572,321	60,960,010	47,397,082	90,771,755
NET ASSETS, at end of the year	\$ 72,429,647	\$ 23,433,475	\$ -	\$ 10,939,529	55,237,374	46,573,782	35,974,681	131,305,870

See Notes to Financial Statements.

Massachusetts Mutual Variable Annuity Separate Account 4

STATEMENTS OF OPERATIONS AND CHANGES IN NET ASSETS (Continued)
For The Year Ended December 31, 2022

	PIMCO Commodity RealReturn® Strategy Sub-Account	PIMCO Income Sub-Account	VY® CBRE Global Real Estate Sub-Account
Investment income			
Dividends	\$ 2,136,455	\$ 6,683	\$ 324,182
Expenses			
Mortality and expense risk fees and administrative charges	126,080	2,027	134,862
Net investment income (loss)	2,010,375	4,656	189,320
Net realized and unrealized gain (loss) on investments			
Realized gain (loss) on sale of fund shares	760,141	(521)	(190,175)
Realized gain distribution	-	6	555,389
Realized gain (loss)	760,141	(515)	365,214
Change in net unrealized appreciation/depreciation of investments	(2,178,525)	(10,374)	(4,015,670)
Net gain (loss) on investments	(1,418,384)	(10,889)	(3,650,456)
Net increase (decrease) in net assets resulting from operations	591,991	(6,233)	(3,461,136)
Capital transactions:			
Transfers of net premiums	144,108	847,627	126,995
Transfers due to death benefits	(111,424)	-	(83,459)
Transfers due to annuity benefit payments	(25,399)	-	(42,494)
Transfers due to withdrawal of funds	(1,368,790)	(891)	(1,101,455)
Transfers due to loans, net of repayments	731	-	1,970
Transfers due to cost of insurance	(43,835)	-	(47,659)
Transfers due to contingent deferred sales charges	(9)	(1,005)	(13)
Transfers due to net charge (credit) to annuitant mortality fluctuation	8,760	-	14,705
Transfers between Sub-Accounts and to/from General Account	1,335,095	(4,194)	103,860
Net increase (decrease) in net assets resulting from capital transactions	(60,763)	841,537	(1,027,550)
Total increase (decrease)	531,228	835,304	(4,488,686)
NET ASSETS, at beginning of the year	8,564,039	-	13,624,068
NET ASSETS, at end of the year	\$ 9,095,267	\$ 835,304	\$ 9,135,382

See Notes to Financial Statements.

Notes To Financial Statements

1. ORGANIZATION

Massachusetts Mutual Variable Annuity Separate Account 4 (“the Separate Account”) is a separate investment account of Massachusetts Mutual Life Insurance Company (“MassMutual”) established on July 9, 1998. The Separate Account is registered as a unit investment trust under the Investment Company Act of 1940 (“the 1940 Act”).

MassMutual maintains eleven segments within the Separate Account: Panorama Premier, Panorama Passage®, MassMutual Artistry, MassMutual Transitions®, MassMutual EvolutionSM, MassMutual RetireEase SelectSM, MassMutual Transitions SelectSM, MassMutual Equity EdgeSM, MassMutual Transitions SelectSM II, MassMutual Capital Vantage® and MassMutual EnvisionSM. Seven of the eleven segments within the Separate Account have multiple tiers: Panorama Passage®, MassMutual EvolutionSM, MassMutual RetireEase SelectSM, MassMutual Transitions SelectSM, MassMutual EquityEdgeSM, MassMutual Transitions SelectSM II and MassMutual Capital Vantage®. The unit values of these tiers differ based on the associated expense ratios.

The assets and liabilities of the Separate Account are clearly identified and distinguished from MassMutual’s other assets and liabilities. The Separate Account assets are not chargeable with liabilities arising from any other MassMutual business.

2. INVESTMENT OF THE SEPARATE ACCOUNT'S ASSETS

For the year or period ended December 31, 2023, the Separate Account consists of ninety-eight sub-accounts which invest in the following mutual funds. All of the sub-accounts may not be available to all of the eleven segments of the Separate Account:

Sub-Accounts	The sub-account listed in the first column invests in the fund in this column
BlackRock 60/40 Target Allocation ETF V.I. Sub-Account (Class III)	BlackRock 60/40 Target Allocation ETF V.I. Fund (Class III) ⁷
Cboe Vest U.S. Large Cap 10% Buffer Strategies V.I. Sub-Account ¹⁵	Cboe Vest U.S. Large Cap 10% Buffer Strategies V.I. Portfolio ^{14, 15}
Delaware Ivy VIP Asset Strategy Sub-Account (Class II)	Delaware Ivy VIP Asset Strategy Portfolio (Class II) ⁶
Fidelity® VIP Contrafund® Sub-Account (Initial Class)	Fidelity® VIP Contrafund® Portfolio (Initial Class) ¹
Fidelity® VIP Contrafund® Sub-Account (Service Class 2)	Fidelity® VIP Contrafund® Portfolio (Service Class 2) ¹
Fidelity® VIP Health Care Sub-Account ¹¹	Fidelity® VIP Health Care Portfolio ^{1, 11}
Fidelity® VIP Overseas Sub-Account (Service Class 2) ¹⁵	Fidelity® VIP Overseas Portfolio (Service Class 2) ^{1, 15}
Fidelity® VIP Real Estate Sub-Account ¹¹	Fidelity® VIP Real Estate Portfolio ^{1, 11}
Fidelity® VIP Strategic Income Sub-Account ¹¹	Fidelity® VIP Strategic Income Portfolio ^{1, 11}
Invesco Oppenheimer V.I. International Growth Sub-Account (Series I)	Invesco Oppenheimer V.I. International Growth Fund (Series I) ³
Invesco Oppenheimer V.I. International Growth Sub-Account (Series II)	Invesco Oppenheimer V.I. International Growth Fund (Series II) ³
Invesco V.I. Capital Appreciation Sub-Account (Series I)	Invesco V.I. Capital Appreciation Fund (Series I) ³
Invesco V.I. Capital Appreciation Sub-Account (Series II)	Invesco V.I. Capital Appreciation Fund (Series II) ³
Invesco V.I. Conservative Balanced Sub-Account (Series I)	Invesco V.I. Conservative Balanced Fund (Series I) ³
Invesco V.I. Conservative Balanced Sub-Account (Series II)	Invesco V.I. Conservative Balanced Fund (Series II) ³
Invesco V.I. Core Plus Bond Sub-Account	Invesco V.I. Core Plus Bond Fund ^{3, 12}
Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series I)	Invesco V.I. Discovery Mid Cap Growth Fund (Series I) ³
Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series II)	Invesco V.I. Discovery Mid Cap Growth Fund (Series II) ³
Invesco V.I. Diversified Dividend Sub-Account (Series I)	Invesco V.I. Diversified Dividend Fund (Series I) ³
Invesco V.I. Diversified Dividend Sub-Account (Series II)	Invesco V.I. Diversified Dividend Fund (Series II) ³
Invesco V.I. Global Sub-Account (Series I)	Invesco V.I. Global Fund (Series I) ³
Invesco V.I. Global Sub-Account (Series II)	Invesco V.I. Global Fund (Series II) ³
Invesco V.I. Global Strategic Income Sub-Account (Series I)	Invesco V.I. Global Strategic Income Fund (Series I) ³
Invesco V.I. Global Strategic Income Sub-Account (Series II)	Invesco V.I. Global Strategic Income Fund (Series II) ³
Invesco V.I. Health Care Sub-Account (Series I)	Invesco V.I. Health Care Fund (Series I) ³
Invesco V.I. Health Care Sub-Account (Series II)	Invesco V.I. Health Care Fund (Series II) ³
Invesco V.I. Main Street Sub-Account (Series I)	Invesco V.I. Main Street Fund® (Series I) ³
Invesco V.I. Main Street Sub-Account (Series II)	Invesco V.I. Main Street Fund® (Series II) ³
Invesco V.I. Technology Sub-Account (Series I)	Invesco V.I. Technology Fund (Series I) ³
Invesco V.I. Technology Sub-Account (Series II)	Invesco V.I. Technology Fund (Series II) ³
Invesco V.I. U.S. Government Money Sub-Account	Invesco V.I. U.S. Government Money Portfolio ³
Janus Henderson Global Technology and Innovation Sub-Account ¹¹	Janus Henderson Global Technology and Innovation Fund ^{11, 13}
MML Aggressive Allocation Sub-Account (Initial Class)	MML Aggressive Allocation Fund (Initial Class) ⁴
MML Aggressive Allocation Sub-Account (Service Class)	MML Aggressive Allocation Fund (Service Class) ⁴
MML American Funds Core Allocation Sub-Account	MML American Funds Core Allocation Fund ⁴
MML American Funds Growth Sub-Account	MML American Funds Growth Fund ⁴

Notes To Financial Statements (Continued)

MML Balanced Allocation Sub-Account (Initial Class)	MML Balanced Allocation Fund (Initial Class) ⁴
MML Balanced Allocation Sub-Account (Service Class)	MML Balanced Allocation Fund (Service Class) ⁴
MML Blend Sub-Account (Initial Class)	MML Blend Fund (Initial Class) ⁴
MML Blend Sub-Account (Service Class)	MML Blend Fund (Service Class) ⁴
MML Blue Chip Growth Sub-Account (Initial Class)	MML Blue Chip Growth Fund (Initial Class) ⁴
MML Blue Chip Growth Sub-Account (Service Class)	MML Blue Chip Growth Fund (Service Class) ⁴
MML Conservative Allocation Sub-Account (Initial Class)	MML Conservative Allocation Fund (Initial Class) ⁴
MML Conservative Allocation Sub-Account (Service Class)	MML Conservative Allocation Fund (Service Class) ⁴
MML Dynamic Bond Sub-Account (Service Class I)	MML Dynamic Bond Fund (Service Class I) ⁴
MML Equity Sub-Account (Initial Class)	MML Equity Fund (Initial Class) ⁴
MML Equity Sub-Account (Service Class)	MML Equity Fund (Service Class) ⁴
MML Equity Income Sub-Account (Initial Class)	MML Equity Income Fund (Initial Class) ⁴
MML Equity Income Sub-Account (Service Class)	MML Equity Income Fund (Service Class) ⁴
MML Equity Index Sub-Account (Class I)	MML Equity Index Fund (Class I) ⁴
MML Equity Index Sub-Account (Service Class I)	MML Equity Index Fund (Service Class I) ⁴
MML Equity Rotation Sub-Account (Service Class I)	MML Equity Rotation Fund (Service Class I) ⁴
MML Focused Equity Sub-Account	MML Focused Equity Fund (Initial Class) ⁴
MML Foreign Sub-Account (Initial Class)	MML Foreign Fund (Initial Class) ⁴
MML Foreign Sub-Account (Service Class)	MML Foreign Fund (Service Class) ⁴
MML Fundamental Equity Sub-Account	MML Fundamental Equity Fund (Initial Class) ⁴
MML Fundamental Value Sub-Account	MML Fundamental Value Fund (Initial Class) ⁴
MML Global Sub-Account (Class I)	MML Global Fund (Class I) ⁴
MML Global Sub-Account (Class II)	MML Global Fund (Class II) ⁴
MML Global Sub-Account (Service Class I)	MML Global Fund (Service Class I) ⁴
MML Growth Allocation Sub-Account (Initial Class)	MML Growth Allocation Fund (Initial Class) ⁴
MML Growth Allocation Sub-Account (Service Class)	MML Growth Allocation Fund (Service Class) ⁴
MML High Yield Sub-Account	MML High Yield Fund ⁴
MML Income & Growth Sub-Account (Initial Class)	MML Income & Growth Fund (Initial Class) ⁴
MML Income & Growth Sub-Account (Service Class)	MML Income & Growth Fund (Service Class) ⁴
MML Inflation-Protected and Income Sub-Account (Initial Class)	MML Inflation-Protected and Income Fund (Initial Class) ⁴
MML Inflation-Protected and Income Sub-Account (Service Class)	MML Inflation-Protected and Income Fund (Service Class) ⁴
MML International Equity Sub-Account	MML International Equity Fund ⁴
MML iShares® 60/40 Allocation Sub-Account ¹¹	MML iShares® 60/40 Allocation Fund ^{4, 11}
MML iShares® 80/20 Allocation Sub-Account ¹¹	MML iShares® 80/20 Allocation Fund ^{4, 11}
MML Large Cap Growth Sub-Account (Initial Class)	MML Large Cap Growth Fund (Initial Class) ⁴
MML Large Cap Growth Sub-Account (Service Class)	MML Large Cap Growth Fund (Service Class) ⁴
MML Managed Bond Sub-Account (Initial Class)	MML Managed Bond Fund (Initial Class) ⁴
MML Managed Bond Sub-Account (Service Class)	MML Managed Bond Fund (Service Class) ⁴
MML Managed Volatility Sub-Account (Initial Class)	MML Managed Volatility Fund (Initial Class) ⁴
MML Managed Volatility Sub-Account (Service Class)	MML Managed Volatility Fund (Service Class) ⁴
MML Mid Cap Growth Sub-Account (Initial Class)	MML Mid Cap Growth Fund (Initial Class) ⁴
MML Mid Cap Growth Sub-Account (Service Class)	MML Mid Cap Growth Fund (Service Class) ⁴
MML Mid Cap Value Sub-Account (Initial Class)	MML Mid Cap Value Fund (Initial Class) ⁴
MML Mid Cap Value Sub-Account (Service Class)	MML Mid Cap Value Fund (Service Class) ⁴
MML Moderate Allocation Sub-Account (Initial Class)	MML Moderate Allocation Fund (Initial Class) ⁴
MML Moderate Allocation Sub-Account (Service Class)	MML Moderate Allocation Fund (Service Class) ⁴

Notes To Financial Statements (Continued)

MML Short-Duration Bond Sub-Account	MML Short-Duration Bond Fund ⁴
MML Small Cap Equity Sub-Account (Initial Class)	MML Small Cap Equity Fund (Initial Class) ⁴
MML Small Cap Equity Sub-Account (Service Class)	MML Small Cap Equity Fund (Service Class) ⁴
MML Small Cap Growth Equity Sub-Account (Initial Class)	MML Small Cap Growth Equity Fund (Initial Class) ⁴
MML Small Cap Growth Equity Sub-Account (Service Class)	MML Small Cap Growth Equity Fund (Service Class) ⁴
MML Small Company Value Sub-Account	MML Small Company Value Fund ⁴
MML Small/Mid Cap Value Sub-Account (Initial Class)	MML Small/Mid Cap Value Fund (Initial Class) ⁴
MML Small/Mid Cap Value Sub-Account (Service Class)	MML Small/Mid Cap Value Fund (Service Class) ⁴
MML Strategic Emerging Markets Sub-Account (Service Class I)	MML Strategic Emerging Markets Fund (Service Class I) ⁴
MML Sustainable Equity Sub-Account (Initial Class)	MML Sustainable Equity Fund (Initial Class) ^{4, 8}
MML Sustainable Equity Sub-Account (Service Class) ⁸	MML Sustainable Equity Fund (Service Class) ^{4, 9}
MML Total Return Bond Sub-Account ⁹	MML Total Return Bond Fund ⁴
MML U.S. Government Money Market Sub-Account	MML U.S. Government Money Market Fund ⁴
PIMCO CommodityRealReturn® Strategy Sub-Account	PIMCO CommodityRealReturn® Strategy Portfolio ⁵
PIMCO Income Sub-Account ¹¹	PIMCO Income Portfolio ^{5, 11}
VY® CBRE Global Real Estate Sub-Account ¹⁰	VY® CBRE Global Real Estate Fund ^{2, 10}

In addition to the ninety-eight sub-accounts, some contract owners may also allocate funds to the Fixed Interest Account (“FIA”), which is part of MassMutual’s general investment account (“General Account”). Because of exemptive and exclusionary provisions in the securities law, interests in the FIA are not registered under the Securities Act of 1933, and the General Account and the FIA are not registered as an investment company under the 1940 Act.

¹Fidelity Management & Research Company LLC is the investment adviser to this Portfolio.

²Voya Investments, LLC is the investment adviser to this Portfolio.

³Invesco Advisers, Inc. is the investment adviser to this Fund.

⁴MML Investment Advisers, LLC is the investment adviser to this Fund.

⁵Pacific Investment Management Company LLC is the investment adviser to this Portfolio.

⁶Delaware Management Company, a series of Macquarie Investment Management Business Trust, is the investment adviser to this Portfolio.

⁷BlackRock Advisors, LLC is the investment adviser for this Fund.

⁸Prior to April 29, 2022, known as MML Growth & Income Sub-Account/Fund (Initial Class).

⁹Prior to April 29, 2022, known as MML Growth & Income Sub-Account/Fund (Service Class).

¹⁰Prior to May 1, 2022, known as VY® Clarion Global Real Estate Sub-Account/Fund.

¹¹This Sub-Account/Fund became available to the Separate Account as an investment option on February 28, 2022.

¹²After the close of business on April 29, 2022, Invesco V.I. Core Plus Bond Fund acquired all the net assets of Invesco V.I. Core Bond Fund pursuant to a plan of reorganization approved by the Board of Trustees of the Invesco V.I. Core Plus Bond Fund on December 1, 2021 and by the shareholders of the Invesco V.I. Core Bond Fund on March 31, 2022. The acquisition was accomplished by a tax-free exchange as of the close of business on April 29, 2022. Shares of Invesco V.I. Core Bond Fund were exchanged for the like class of shares of Invesco V.I. Core Plus Bond Fund, based on the relative net asset value of the two funds which resulted in Invesco V.I. Core Bond Fund receiving 1.15816327 shares of Invesco V.I. Core Plus Bond Fund in exchange of 1 share of Invesco V.I. Core Bond Fund. As a result of the underlying fund merger, the subaccount name changed from Invesco V.I. Core Bond Fund to Invesco V.I. Core Plus Bond Fund.

¹³Janus Henderson Investors US, LLC is the investment adviser to this Fund.

¹⁴Cboe VestSM Financial LLC is the investment adviser to this Fund.

¹⁵This Sub-Account/Fund became available to the Separate Account as an investment option on May 1, 2023.

3. SIGNIFICANT ACCOUNTING POLICIES

The following is a summary of significant accounting policies followed by the Separate Account in preparation of the financial statements in conformity with generally accepted accounting principles. Massachusetts Mutual Variable Annuity Separate Account 4 follows the accounting and reporting guidance in FASB Accounting Standards Codification 946.

A. Investment Valuation

Investments in the underlying funds held by each sub-account are carried at fair value which is based on the closing net asset value of each of the respective underlying funds, which value their investment securities at fair value.

B. Accounting for Investments

Investment transactions are accounted for on a trade-date basis and identified cost is the basis followed in determining the cost of investments sold for financial statement purposes. Dividend income and gains from realized gain distributions are recorded on the ex-distribution date and they are generally reinvested in the underlying investment funds.

C. Federal Income Taxes

MassMutual is taxed under federal law as a life insurance company under the provisions of the 1986 Internal Revenue Code, as amended. Under existing federal law, no taxes are payable on net investment income and net realized capital gains attributable to contracts, which depend on the Separate Account's investment performance. Accordingly, no provision for federal income tax has been made. MassMutual may, however, make such a charge in the future if an unanticipated change of current law results in a tax liability attributable to the Separate Account.

D. Contract Charges

See Note 8B for charges associated with the contracts.

E. Estimates

The preparation of financial statements in conformity with U.S. generally accepted accounting principles requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. Actual results could differ from those estimates.

F. Loans

If the certificate is a tax-sheltered annuity ("TSA"), the participants may be able to take a loan under their certificate. All such loans must conform to the requirements of the Internal Revenue Code. There are limitations on the amount of the loan the participants can take, and there is a required loan repayment schedule. When a loan is made, the Separate Account transfers the amount of the loan to MassMutual, thereby decreasing both the investments and net assets of the Separate Account by an equal amount. The contract owner is charged interest on the outstanding loan amount based on the interest rate then in effect.

G. Annuitant Mortality Fluctuation

The Separate Account contributes to an Annuitant Mortality Fluctuation Fund (AMFF) reserve maintained by MassMutual as required by regulatory authorities to provide for mortality losses incurred. The AMFF reserve is adjusted quarterly for mortality losses and gains and its proportionate share of changes in value. Transfers to or from MassMutual are then made quarterly to adjust the AMFF reserve which is held in the Separate Account. Net transfers from the MassMutual to the Separate Account totaled \$948,840 and \$1,031,370 for the years ended December 31, 2023 and 2022, respectively. The AMFF reserve is subject to a maximum of 3% of the Separate Account's annuity reserves. Any mortality losses in excess of this reserve will be borne by MassMutual. The AMFF reserve is not available to owners of the contracts except to the extent necessary to cover mortality losses under the contracts.

H. Annuity Reserves

Annuity reserves are developed by using accepted actuarial methods and are computed using the 1994 MGDB table, except for the MassMutual RetireEase Select SM Segment which uses the Annuity 2000 table.

4. FAIR VALUE OF FINANCIAL INSTRUMENTS

The Separate Account defines fair value as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. In determining fair value, the Separate Account generally uses the market approach as the valuation technique due to the nature of the mutual fund investments offered in the Separate Account. This technique maximizes the use of observable inputs and minimizes the use of unobservable inputs. Investments in mutual funds are valued at the mutual fund's closing net asset value per share on the day of valuation.

Valuation Inputs: Various inputs are used to determine the value of the Separate Account's investments. These inputs are summarized in the three broad levels listed below:

- **Level 1** – quoted prices in active markets for identical securities
- **Level 2** – observable inputs other than Level 1 quoted prices (including, but not limited to, quoted prices for similar securities, interest rates, prepayment speeds and credit risk)
- **Level 3** – unobservable inputs

The investments of the Separate Account are measured at fair value. All the investments are categorized as Level 1 as of December 31, 2023. There have been no transfers between levels for the year ended December 31, 2023.

5. RELATED PARTY TRANSACTIONS

A. Sales Agreements

The contracts currently being offered are sold by both registered representatives of MML Investors Services, LLC ("MMLIS"), a subsidiary of MassMutual, and by registered representatives of other broker-dealers who have entered into distribution agreements with MML Strategic Distributors, LLC ("MSD"), a subsidiary of MassMutual. Pursuant to separate underwriting agreements with MassMutual, on its own behalf and on behalf of the Separate Account, MMLIS serves as principal underwriter of the contracts sold by its registered representatives and MSD serves as principal underwriter of the contracts sold by registered representatives of other broker-dealers who have entered into distribution agreements with MSD.

Notes To Financial Statements (Continued)

Both MMLIS and MSD are registered with the Securities and Exchange Commission (the “SEC”) as broker-dealers under the Securities and Exchange Act of 1934 and are members of the Financial Industry Regulatory Authority (“FINRA”). Commissions for sales of contracts by MMLIS registered representatives are paid on behalf of MMLIS to its registered representatives. Commissions for sales of contracts by registered representatives of other broker-dealers are paid on behalf of MSD to those broker-dealers. MMLIS and MSD also receive compensation for their actions as principal underwriters of the contracts.

B. Receivable from/Payable to MassMutual

Certain fees such as mortality and expense risk fees are charges paid between the General Account and Separate Account. The General Account is not registered as an investment company under the 1940 Act.

6. PURCHASES AND SALES OF INVESTMENTS

The cost of purchases and proceeds from sales of investments for each of the years in the two-year period ended December 31, 2023 were as follows:

	BlackRock 60/40 Target Allocation ETF V.I. Sub-Account (Class III)	Choe Vest U.S. Large Cap 10% Buffer Strategies V.I. Sub-Account	Delaware Ivy VIP Asset Strategy Sub-Account (Class II)	Fidelity® VIP Contrafund® Sub-Account (Initial Class)	Fidelity® VIP Contrafund® Sub-Account (Service Class 2)	Fidelity® VIP Health Care Sub-Account	Fidelity® VIP Overseas Sub-Account (Service Class 2)	Fidelity® VIP Real Estate Sub-Account
2023								
Cost of purchases	\$ 1,408,248	\$ 465,572	\$ 512,195	\$ 11,045,437	\$ 19,845,188	\$ 608,368	\$ 145,843	\$ 363,521
Proceeds from sales	(1,192,333)	(7,358)	(1,488,430)	(36,788,207)	(32,322,582)	(24,429)	(1,210)	(16,641)
	Fidelity® VIP Strategic Income Sub-Account	Invesco Oppenheimer V.I. International Growth Sub-Account (Series I)	Invesco Oppenheimer V.I. International Growth Sub-Account (Series II)	Invesco V.I. Capital Appreciation Sub-Account (Series I)	Invesco V.I. Capital Appreciation Sub-Account (Series II)	Invesco V.I. Conservative Balanced Sub-Account (Series I)	Invesco V.I. Conservative Balanced Sub-Account (Series II)	Invesco V.I. Core Plus Bond Sub-Account
2023 (Continued)								
Cost of purchases	\$ 517,514	\$ 463,946	\$ 1,328,341	\$ 5,988,728	\$ 745,568	\$ 123,415	\$ 227	\$ 36,176
Proceeds from sales	(33,236)	(3,427,319)	(3,471,443)	(27,590,740)	(1,888,281)	(611,536)	(35,678)	(155,889)
	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series I)	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series II)	Invesco V.I. Diversified Dividend Sub-Account (Series I)	Invesco V.I. Diversified Dividend Sub-Account (Series II)	Invesco V.I. Global Sub-Account (Series I)	Invesco V.I. Global Sub-Account (Series II)	Invesco V.I. Global Strategic Income Sub-Account (Series I)	Invesco V.I. Global Strategic Income Sub-Account (Series II)
2023 (Continued)								
Cost of purchases	\$ 5,956,629	\$ 2,064,650	\$ 783,671	\$ 1,187,934	\$ 14,872,907	\$ 9,661,292	\$ 4,382,891	\$ 1,756,553
Proceeds from sales	(11,695,206)	(3,123,755)	(896,666)	(1,974,283)	(26,205,538)	(10,757,487)	(19,582,716)	(6,341,266)
	Invesco V.I. Health Care Sub-Account (Series I)	Invesco V.I. Health Care Sub-Account (Series II)	Invesco V.I. Main Street Sub-Account (Series I)	Invesco V.I. Main Street Sub-Account (Series II)	Invesco V.I. Technology Sub-Account (Series I)	Invesco V.I. Technology Sub-Account (Series II)	Invesco V.I. U.S. Government Money Sub-Account	Janus Henderson Global Technology and Innovation Sub-Account
2023 (Continued)								
Cost of purchases	\$ 322,993	\$ 182,116	\$ 2,372,466	\$ 2,154,255	\$ 1,032,349	\$ 677,423	\$ 1,861,345	\$ 321,303
Proceeds from sales	(1,273,222)	(1,570,948)	(3,527,250)	(3,427,627)	(1,105,256)	(1,650,668)	(2,571,561)	(34,810)

6. PURCHASES AND SALES OF INVESTMENTS (Continued)

	<u>MML Aggressive Allocation Sub-Account (Initial Class)</u>	<u>MML Aggressive Allocation Sub-Account (Service Class)</u>	<u>MML American Funds Core Allocation Sub-Account</u>	<u>MML American Funds Growth Sub-Account</u>	<u>MML Balanced Allocation Sub-Account (Initial Class)</u>	<u>MML Balanced Allocation Sub-Account (Service Class)</u>	<u>MML Blend Sub-Account (Initial Class)</u>	<u>MML Blend Sub-Account (Service Class)</u>
2023 (Continued)								
Cost of purchases	\$ 4,513,061	\$ 12,555,132	\$ 108,562,080	\$ 53,998,707	\$ 7,285,252	\$ 35,887,918	\$ 1,634,929	\$ 9,656,752
Proceeds from sales	(4,848,262)	(11,936,760)	(132,364,921)	(38,782,479)	(11,817,024)	(51,833,026)	(9,495,746)	(20,572,217)
	<u>MML Blue Chip Growth Sub-Account (Initial Class)</u>	<u>MML Blue Chip Growth Sub-Account (Service Class)</u>	<u>MML Conservative Allocation Sub-Account (Initial Class)</u>	<u>MML Conservative Allocation Sub-Account (Service Class)</u>	<u>MML Dynamic Bond Sub-Account (Service Class I)</u>	<u>MML Equity Sub-Account (Initial Class)</u>	<u>MML Equity Sub-Account (Service Class)</u>	<u>MML Equity Income Sub-Account (Initial Class)</u>
2023 (Continued)								
Cost of purchases	\$ 1,281,389	\$ 7,334,611	\$ 7,884,760	\$ 30,132,742	\$ 2,170,509	\$ 2,739,711	\$ 10,705,707	\$ 16,922,914
Proceeds from sales	(9,022,334)	(23,125,220)	(10,339,019)	(50,884,223)	(2,013,929)	(3,432,228)	(17,681,104)	(21,584,808)
	<u>MML Equity Income Sub-Account (Service Class)</u>	<u>MML Equity Index Sub-Account (Class I)</u>	<u>MML Equity Index Sub-Account (Service Class I)</u>	<u>MML Equity Rotation Sub-Account (Service Class I)</u>	<u>MML Focused Equity Sub-Account</u>	<u>MML Foreign Sub-Account (Initial Class)</u>	<u>MML Foreign Sub-Account (Service Class)</u>	<u>MML Fundamental Equity Sub-Account</u>
2023 (Continued)								
Cost of purchases	\$ 11,083,453	\$ 5,109,783	\$ 3,747,374	\$ 299,613	\$ 4,869,194	\$ 4,532,896	\$ 1,083,293	\$ 2,634,588
Proceeds from sales	(16,935,976)	(4,900,033)	(9,441,003)	(798,981)	(4,325,992)	(22,760,528)	(1,890,264)	(3,927,387)
	<u>MML Fundamental Value Sub-Account</u>	<u>MML Global Sub-Account (Class I)</u>	<u>MML Global Sub-Account (Class II)</u>	<u>MML Global Sub-Account (Service Class I)</u>	<u>MML Growth Allocation Sub-Account (Initial Class)</u>	<u>MML Growth Allocation Sub-Account (Service Class)</u>	<u>MML High Yield Sub-Account</u>	<u>MML Income & Growth Sub-Account (Initial Class)</u>
2023 (Continued)								
Cost of purchases	\$ 4,290,671	\$ 748,663	\$ 441,664	\$ 3,338,227	\$ 47,341,099	\$ 101,334,041	\$ 6,782,921	\$ 3,784,211
Proceeds from sales	(4,598,924)	(472,388)	(560,061)	(2,781,610)	(41,518,153)	(75,509,560)	(6,892,787)	(3,374,419)

Notes To Financial Statements (Continued)

6. PURCHASES AND SALES OF INVESTMENTS (Continued)

	<u>MML Income & Growth Sub-Account</u> (Service Class)	<u>MML Inflation- Protected and Income Sub-Account</u> (Initial Class)	<u>MML Inflation- Protected and Income Sub-Account</u> (Service Class)	<u>MML International Equity Sub-Account</u>	<u>MML iShares® 60/40 Allocation Sub-Account</u>	<u>MML iShares® 80/20 Allocation Sub-Account</u>	<u>MML Large Cap Growth Sub-Account</u> (Initial Class)	<u>MML Large Cap Growth Sub-Account</u> (Service Class)
2023 (Continued)								
Cost of purchases	\$ 6,536,306	\$ 13,308,684	\$ 4,717,110	\$ 1,769,768	\$ 6,658,858	\$ 17,747,705	\$ 2,257,133	\$ 6,292,436
Proceeds from sales	(4,955,845)	(16,573,698)	(7,924,161)	(1,216,375)	(262,603)	(2,736,453)	(2,963,835)	(2,937,703)
	<u>MML Managed Bond Sub-Account</u> (Initial Class)	<u>MML Managed Bond Sub-Account</u> (Service Class)	<u>MML Managed Volatility Sub-Account</u> (Initial Class)	<u>MML Managed Volatility Sub-Account</u> (Service Class)	<u>MML Mid Cap Growth Sub-Account</u> (Initial Class)	<u>MML Mid Cap Growth Sub-Account</u> (Service Class)	<u>MML Mid Cap Value Sub-Account</u> (Initial Class)	<u>MML Mid Cap Value Sub-Account</u> (Service Class)
2023 (Continued)								
Cost of purchases	\$ 8,067,912	\$ 16,778,620	\$ 14,095,459	\$ 3,856,363	\$ 790,566	\$ 3,521,879	\$ 24,672,465	\$ 11,909,398
Proceeds from sales	(13,070,622)	(37,864,477)	(11,909,607)	(4,577,203)	(8,675,724)	(13,813,944)	(19,528,048)	(9,947,322)
	<u>MML Moderate Allocation Sub-Account</u> (Initial Class)	<u>MML Moderate Allocation Sub-Account</u> (Service Class)	<u>MML Short-Duration Bond Sub-Account</u>	<u>MML Small Cap Equity Sub-Account</u> (Initial Class)	<u>MML Small Cap Equity Sub-Account</u> (Service Class)	<u>MML Small Cap Growth Equity Sub-Account</u> (Initial Class)	<u>MML Small Cap Growth Equity Sub-Account</u> (Service Class)	<u>MML Small Company Value Sub-Account</u>
2023 (Continued)								
Cost of purchases	\$ 24,122,948	\$ 140,656,460	\$ 6,252,387	\$ 606,888	\$ 2,299,808	\$ 5,399,898	\$ 953,581	\$ 1,445,599
Proceeds from sales	(25,634,865)	(227,355,739)	(6,174,004)	(3,065,607)	(4,317,999)	(11,052,205)	(3,624,049)	(4,056,341)
	<u>MML Small/Mid Cap Value Sub-Account</u> (Initial Class)	<u>MML Small/Mid Cap Value Sub-Account</u> (Service Class)	<u>MML Strategic Emerging Markets Sub-Account</u> (Service Class I)	<u>MML Sustainable Equity Sub-Account</u> (Initial Class)	<u>MML Sustainable Equity Sub-Account</u> (Service Class)	<u>MML Total Return Bond Sub-Account</u>	<u>MML U.S. Government Money Market Sub-Account</u>	<u>PIMCO Commodity RealReturn® Strategy Sub-Account</u>
2023 (Continued)								
Cost of purchases	\$ 12,826,743	\$ 4,420,416	\$ 996,804	\$ 18,695,587	16,391,572	5,119,535	41,619,200	1,861,740
Proceeds from sales	(12,607,938)	(3,693,240)	(1,857,338)	(8,541,008)	(8,040,734)	(5,838,837)	(56,212,686)	(2,171,415)

6. PURCHASES AND SALES OF INVESTMENTS (Continued)

	PIMCO		VY®	
	Income		CBRE	
	Sub-Account		Global	
	Sub-Account		Real Estate	
	Sub-Account		Sub-Account	
2023 (Continued)				
Cost of purchases	\$	1,265,650	\$	809,966
Proceeds from sales		(32,871)		(1,566,092)

6. PURCHASES AND SALES OF INVESTMENTS (Continued)

	BlackRock 60/40 Target Allocation ETF V.I. Sub-Account (Class III)	Delaware Ivy VIP Asset Strategy Sub-Account (Class II)	Fidelity® VIP Contrafund® Sub-Account (Initial Class)	Fidelity® VIP Contrafund® Sub-Account (Service Class 2)	Fidelity® VIP Healthcare Sub-Account	Fidelity® VIP Real Estate Sub-Account	Fidelity® VIP Strategic Income Sub-Account	Invesco Oppenheimer V.I. International Growth Sub-Account (Series I)
2022								
Cost of purchases	\$ 2,554,902	\$ 1,954,988	\$ 19,530,330	\$ 26,001,389	\$ 466,103	\$ 196,967	\$ 222,268	\$ 5,484,471
Proceeds from sales	(1,532,645)	(1,398,464)	(27,667,404)	(28,841,489)	(20,092)	(12,874)	(11,301)	(2,122,186)
	Invesco Oppenheimer V.I. International Growth Sub-Account (Series II)	Invesco V.I. Capital Appreciation Sub-Account (Series I)	Invesco V.I. Capital Appreciation Sub-Account (Series II)	Invesco V.I. Conservative Balanced Sub-Account (Series I)	Invesco V.I. Conservative Balanced Sub-Account (Series II)	Invesco V.I. Core Plus Bond Sub-Account	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series I)	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series II)
2022 (Continued)								
Cost of purchases	\$ 6,848,332	\$ 51,714,769	\$ 3,351,030	\$ 568,390	\$ 4,349	\$ 61,719	\$ 33,352,710	\$ 10,410,476
Proceeds from sales	(3,604,668)	(18,815,019)	(2,414,713)	(551,694)	(1,719)	(108,656)	(15,136,294)	(3,456,290)
	Invesco V.I. Diversified Dividend Sub-Account (Series I)	Invesco V.I. Diversified Dividend Sub-Account (Series II)	Invesco V.I. Global Sub-Account (Series I)	Invesco V.I. Global Sub-Account (Series II)	Invesco V.I. Global Strategic Income Sub-Account (Series I)	Invesco V.I. Global Strategic Income Sub-Account (Series II)	Invesco V.I. Health Care Sub-Account (Series I)	Invesco V.I. Health Care Sub-Account (Series II)
2022 (Continued)								
Cost of purchases	\$ 1,070,403	\$ 2,427,901	\$ 36,265,118	\$ 14,735,294	\$ 1,462,361	\$ 1,661,279	\$ 1,724,667	\$ 1,973,266
Proceeds from sales	(635,538)	(2,625,659)	(18,294,943)	(8,573,412)	(22,958,183)	(9,385,500)	(1,333,797)	(2,072,156)
	Invesco V.I. Main Street Sub-Account (Series I)	Invesco V.I. Main Street Sub-Account (Series II)	Invesco V.I. Technology Sub-Account (Series I)	Invesco V.I. Technology Sub-Account (Series II)	Invesco V.I. U.S. Government Money Sub-Account	Janus Henderson Global Technology and Innovation Sub-Account	MML Aggressive Allocation Sub-Account (Initial Class)	MML Aggressive Allocation Sub-Account (Service Class)
2022 (Continued)								
Cost of purchases	\$ 11,880,801	\$ 9,213,436	\$ 2,972,065	\$ 3,686,465	\$ 1,799,306	\$ 308,876	\$ 6,616,890	\$ 15,694,788
Proceeds from sales	(3,231,854)	(3,069,684)	(1,086,351)	(1,695,172)	(911,914)	(7,182)	(6,372,038)	(14,242,336)

6. PURCHASES AND SALES OF INVESTMENTS (Continued)

	<u>MML American Funds Core Allocation Sub-Account</u>	<u>MML American Funds Growth Sub-Account</u>	<u>MML American Funds International Sub-Account</u>	<u>MML Balanced Allocation Sub-Account (Initial Class)</u>	<u>MML Balanced Allocation Sub-Account (Service Class)</u>	<u>MML Blend Sub-Account (Initial Class)</u>	<u>MML Blend Sub-Account (Service Class)</u>	<u>MML Blue Chip Growth Sub-Account (Initial Class)</u>
2022 (Continued)								
Cost of purchases	\$ 89,150,126	\$ 67,760,877	\$ 11,432,359	\$ 9,445,043	\$ 43,519,050	\$ 3,384,137	\$ 20,536,198	\$ 10,250,701
Proceeds from sales	(125,972,442)	(29,766,249)	(45,881,582)	(11,530,443)	(54,716,996)	(8,178,825)	(22,781,897)	(6,428,670)
	<u>MML Blue Chip Growth Sub-Account (Service Class)</u>	<u>MML Conservative Allocation Sub-Account (Initial Class)</u>	<u>MML Conservative Allocation Sub-Account (Service Class)</u>	<u>MML Dynamic Bond Sub-Account (Service Class I)</u>	<u>MML Equity Sub-Account (Initial Class)</u>	<u>MML Equity Sub-Account (Service Class)</u>	<u>MML Equity Income Sub-Account (Initial Class)</u>	<u>MML Equity Income Sub-Account (Service Class)</u>
2022 (Continued)								
Cost of purchases	\$ 37,056,942	\$ 12,533,107	\$ 54,734,471	\$ 2,054,803	\$ 4,223,062	\$ 15,041,650	\$ 20,682,784	\$ 19,972,536
Proceeds from sales	(16,962,130)	(11,026,002)	(60,085,271)	(1,337,379)	(3,007,175)	(16,216,399)	(30,299,903)	(14,179,879)
	<u>MML Equity Index Sub-Account (Class I)</u>	<u>MML Equity Index Sub-Account (Service Class I)</u>	<u>MML Equity Momentum Sub-Account (Service Class I)</u>	<u>MML Equity Rotation Sub-Account (Service Class I)</u>	<u>MML Focused Equity Sub-Account</u>	<u>MML Foreign Sub-Account (Initial Class)</u>	<u>MML Foreign Sub-Account (Service Class)</u>	<u>MML Fundamental Equity Sub-Account</u>
2022 (Continued)								
Cost of purchases	\$ 3,242,008	\$ 3,436,157	\$ 204,346	\$ 394,392	\$ 6,176,006	\$ 15,634,948	\$ 3,384,898	\$ 6,445,554
Proceeds from sales	(4,539,481)	(9,390,034)	(2,082,896)	(440,874)	(3,812,436)	(16,120,202)	(892,376)	(3,169,846)
	<u>MML Fundamental Value Sub-Account</u>	<u>MML Global Sub-Account (Class I)</u>	<u>MML Global Sub-Account (Class II)</u>	<u>MML Global Sub-Account (Service Class I)</u>	<u>MML Growth Allocation Sub-Account (Initial Class)</u>	<u>MML Growth Allocation Sub-Account (Service Class)</u>	<u>MML High Yield Sub-Account</u>	<u>MML Income & Growth Sub-Account (Initial Class)</u>
2022 (Continued)								
Cost of purchases	\$ 9,587,638	\$ 3,032,074	\$ 2,793,891	\$ 15,971,617	\$ 46,352,243	\$ 104,254,279	\$ 6,534,691	\$ 3,482,994
Proceeds from sales	(4,509,080)	(430,278)	(323,025)	(2,149,574)	(39,876,876)	(83,485,586)	(8,478,491)	(2,983,621)

6. PURCHASES AND SALES OF INVESTMENTS (Continued)

	<u>MML Income & Growth Sub-Account (Service Class)</u>	<u>MML Inflation- Protected and Income Sub-Account (Initial Class)</u>	<u>MML Inflation- Protected and Income Sub-Account (Service Class)</u>	<u>MML International Equity Sub-Account</u>	<u>MML iShares 60/40 Allocation Sub-Account</u>	<u>MML iShares 80/20 Allocation Sub-Account</u>	<u>MML Large Cap Growth Sub-Account (Initial Class)</u>	<u>MML Large Cap Growth Sub-Account (Service Class)</u>
2022 (Continued)								
Cost of purchases	\$ 6,170,988	\$ 12,921,559	\$ 13,137,631	\$ 2,360,905	\$ 6,124,696	\$ 21,027,372	\$ 1,653,896	\$ 3,773,297
Proceeds from sales	(5,339,118)	(25,284,905)	(11,080,559)	(1,220,916)	(687,112)	(1,138,800)	(2,085,471)	(2,489,083)
	<u>MML Managed Bond Sub-Account (Initial Class)</u>	<u>MML Managed Bond Sub-Account (Service Class)</u>	<u>MML Managed Volatility Sub-Account (Initial Class)</u>	<u>MML Managed Volatility Sub-Account (Service Class)</u>	<u>MML Mid Cap Growth Sub-Account (Initial Class)</u>	<u>MML Mid Cap Growth Sub-Account (Service Class)</u>	<u>MML Mid Cap Value Sub-Account (Initial Class)</u>	<u>MML Mid Cap Value Sub-Account (Service Class)</u>
2022 (Continued)								
Cost of purchases	\$ 6,084,626	\$ 14,274,715	\$ 1,114,622	\$ 1,577,667	\$ 19,859,720	\$ 33,163,456	\$ 30,331,014	\$ 19,179,135
Proceeds from sales	(18,263,237)	(42,351,971)	(17,529,263)	(5,151,220)	(8,512,086)	(12,452,152)	(27,522,781)	(9,903,303)
	<u>MML Moderate Allocation Sub-Account (Initial Class)</u>	<u>MML Moderate Allocation Sub-Account (Service Class)</u>	<u>MML Short-Duration Bond Sub-Account</u>	<u>MML Small Cap Equity Sub-Account (Initial Class)</u>	<u>MML Small Cap Equity Sub-Account (Service Class)</u>	<u>MML Small Cap Growth Equity Sub-Account (Initial Class)</u>	<u>MML Small Cap Growth Equity Sub-Account (Service Class)</u>	<u>MML Small Company Value Sub-Account</u>
2022 (Continued)								
Cost of purchases	\$ 25,447,152	\$ 159,930,784	\$ 7,020,660	\$ 3,259,130	\$ 4,921,625	\$ 24,985,559	\$ 9,904,791	\$ 15,923,749
Proceeds from sales	(26,004,262)	(221,794,394)	(8,076,198)	(3,501,051)	(3,616,982)	(12,597,778)	(4,310,658)	(3,460,791)
	<u>MML Small/Mid Cap Value Sub-Account (Initial Class)</u>	<u>MML Small/Mid Cap Value Sub-Account (Service Class)</u>	<u>MML Special Situations Sub-Account (Service Class I)</u>	<u>MML Strategic Emerging Markets Sub-Account (Service Class I)</u>	<u>MML Sustainable Equity Sub-Account (Initial Class)</u>	<u>MML Sustainable Equity Sub-Account (Service Class)</u>	<u>MML Total Return Bond Sub-Account</u>	<u>MML U.S. Government Money Market Sub-Account</u>
2022 (Continued)								
Cost of purchases	\$ 24,794,452	\$ 9,057,098	\$ 84,719	\$ 5,875,571	\$ 10,274,803	\$ 9,959,031	\$ 3,866,228	\$ 96,739,029
Proceeds from sales	(13,733,662)	(3,540,318)	(803,058)	(1,824,764)	(7,928,875)	(6,105,886)	(8,045,100)	(56,206,203)

6. PURCHASES AND SALES OF INVESTMENTS (Continued)

	<u>PIMCO Commodity RealReturn® Strategy Sub-Account</u>		<u>PIMCO Income Sub-Account</u>		<u>VY® CBRE Global Real Estate Sub-Account</u>	
<u>2022 (Continued)</u>						
Cost of purchases	\$	5,833,550	\$	854,640	\$	1,511,554
Proceeds from sales		(3,883,899)		(8,450)		(1,794,455)

Notes To Financial Statements (Continued)

7. NET INCREASE (DECREASE) IN OUTSTANDING UNITS

The changes in outstanding units for the two years ended December 31, 2023 were as follows:

	BlackRock 60/40 Target Allocation ETF V.I. Sub-Account (Class III)	Cboe Vest U.S. Large Cap 10% Buffer Strategies V.I. Sub-Account	Delaware Ivy VIP Asset Strategy Sub-Account (Class II)	Fidelity® VIP Contrafund® Sub-Account (Initial Class)	Fidelity® VIP Contrafund® Sub-Account (Service Class 2)	Fidelity® VIP Health Care Sub-Account	Fidelity® VIP Overseas Sub-Account (Service Class 2)	Fidelity® VIP Real Estate Sub-Account
2023								
Units purchased	75,966	44,509	20,515	35,377	647,341	46,113	14,630	37,360
Units withdrawn	(70,450)	(261)	(87,372)	(473,574)	(963,721)	(802)	(23)	(195)
Units transferred between Sub-Accounts and to/from the Fixed Account	(768)	(200)	(6,183)	(168,906)	119,851	12,855	13	3,293
Net increase (decrease)	4,748	44,048	(73,040)	(607,103)	(196,529)	58,166	14,620	40,458
	Fidelity® VIP Strategic Income Sub-Account	Invesco Oppenheimer V.I. International Growth Sub-Account (Series I)	Invesco Oppenheimer V.I. International Growth Sub-Account (Series II)	Invesco V.I. Capital Appreciation Sub-Account (Series I)	Invesco V.I. Capital Appreciation Sub-Account (Series II)	Invesco V.I. Conservative Balanced Sub-Account (Series I)	Invesco V.I. Conservative Balanced Sub-Account (Series II)	Invesco V.I. Core Plus Bond Sub-Account
2023 (Continued)								
Units purchased	48,029	7,058	69,627	16,223	1,349	1,284	-	1
Units withdrawn	(487)	(83,881)	(178,269)	(418,829)	(47,740)	(28,735)	(2,173)	(9,860)
Units transferred between Sub-Accounts and to/from the Fixed Account	1,722	(27,831)	18,080	(135,544)	18,869	(2,289)	-	(47)
Net increase (decrease)	49,264	(104,654)	(90,562)	(538,150)	(27,522)	(29,740)	(2,173)	(9,906)
	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series I)	Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series II)	Invesco V.I. Diversified Dividend Sub-Account (Series I)	Invesco V.I. Diversified Dividend Sub-Account (Series II)	Invesco V.I. Global Sub-Account (Series I)	Invesco V.I. Global Sub-Account (Series II)	Invesco V.I. Global Strategic Income Sub-Account (Series I)	Invesco V.I. Global Strategic Income Sub-Account (Series II)
2023 (Continued)								
Units purchased	16,962	118,931	7,131	3,453	22,224	145,976	41,222	87,699
Units withdrawn	(270,262)	(118,587)	(45,451)	(106,477)	(412,832)	(388,183)	(926,606)	(397,794)
Units transferred between Sub-Accounts and to/from the Fixed Account	125,494	4,249	3,077	(14,949)	(252,398)	(598)	1,338	7,914
Net increase (decrease)	(127,806)	4,593	(35,243)	(117,973)	(643,006)	(242,805)	(884,046)	(302,181)
	Invesco V.I. Health Care Sub-Account (Series I)	Invesco V.I. Health Care Sub-Account (Series II)	Invesco V.I. Main Street Sub-Account (Series I)	Invesco V.I. Main Street Sub-Account (Series II)	Invesco V.I. Technology Sub-Account (Series I)	Invesco V.I. Technology Sub-Account (Series II)	Invesco V.I. U.S. Government Money Sub-Account	Janus Henderson Global Technology and Innovation Sub-Account
2023 (Continued)								
Units purchased	3,542	1,941	3,148	30,050	9,525	1,990	7,637	25,201
Units withdrawn	(29,588)	(35,973)	(73,235)	(136,000)	(39,183)	(30,968)	(192,455)	(271)
Units transferred between Sub-Accounts and to/from the Fixed Account	2,536	(5,515)	(13,987)	(3,027)	16,011	6,373	93,126	3,817
Net increase (decrease)	(23,510)	(39,547)	(84,074)	(108,977)	(13,647)	(22,605)	(91,692)	28,747

Notes To Financial Statements (Continued)

7. NET INCREASE (DECREASE) IN OUTSTANDING UNITS (Continued)

	MML Aggressive Allocation Sub-Account	MML Aggressive Allocation Sub-Account	MML American Funds Core Allocation Sub-Account	MML American Funds Growth Sub-Account	MML Balanced Allocation Sub-Account	MML Balanced Allocation Sub-Account	MML Blend Sub-Account	MML Blend Sub-Account
	(Initial Class)	(Service Class)			(Initial Class)	(Service Class)	(Initial Class)	(Service Class)
2023 (Continued)								
Units purchased	20,498	158,859	354,195	1,056,639	16,296	534,552	9,217	488,355
Units withdrawn	(179,907)	(546,308)	(6,485,414)	(925,146)	(556,796)	(2,907,212)	(272,188)	(1,029,778)
Units transferred between Sub-Accounts and to/from the Fixed Account	(4,793)	4,169	50,070	59,638	(21,375)	(167,964)	(8,593)	2,686
Net increase (decrease)	(164,202)	(383,280)	(6,081,149)	191,131	(561,875)	(2,540,624)	(271,564)	(538,737)
	MML Blue Chip Growth Sub-Account	MML Blue Chip Growth Sub-Account	MML Conservative Allocation Sub-Account	MML Conservative Allocation Sub-Account	MML Dynamic Bond Sub-Account	MML Equity Sub-Account	MML Equity Sub-Account	MML Equity Income Sub-Account
	(Initial Class)	(Service Class)	(Initial Class)	(Service Class)	(Service Class I)	(Initial Class)	(Service Class)	(Initial Class)
2023 (Continued)								
Units purchased	6,622	368,782	7,019	309,248	170,594	5,686	102,634	19,757
Units withdrawn	(117,042)	(766,078)	(488,076)	(2,865,731)	(180,690)	(80,960)	(568,999)	(491,709)
Units transferred between Sub-Accounts and to/from the Fixed Account	(24,777)	21,980	71,714	(156,342)	(6,127)	(12,383)	(77,407)	18,576
Net increase (decrease)	(135,197)	(375,316)	(409,343)	(2,712,825)	(16,223)	(87,657)	(543,772)	(453,376)
	MML Equity Income Sub-Account	MML Equity Index Sub-Account	MML Equity Index Sub-Account	MML Equity Rotation Sub-Account	MML Focused Equity Sub-Account	MML Foreign Sub-Account	MML Foreign Sub-Account	MML Fundamental Equity Sub-Account
	(Service Class)	(Class I)	(Service Class I)	(Service Class I)		(Initial Class)	(Service Class)	
2023 (Continued)								
Units purchased	145,659	9,042	2,941	14,878	113,199	25,794	18,788	97,598
Units withdrawn	(591,498)	(105,034)	(200,779)	(35,219)	(143,704)	(702,709)	(87,309)	(129,645)
Units transferred between Sub-Accounts and to/from the Fixed Account	(17,147)	33,339	(6,614)	3,823	9,959	(472,592)	10,881	30,614
Net increase (decrease)	(462,986)	(62,653)	(204,452)	(16,518)	(20,546)	(1,149,507)	(57,640)	(1,433)
	MML Fundamental Value Sub-Account	MML Global Sub-Account	MML Global Sub-Account	MML Global Sub-Account	MML Growth Allocation Sub-Account	MML Growth Allocation Sub-Account	MML High Yield Sub-Account	MML Income & Growth Sub-Account
		(Class I)	(Class II)	(Service Class I)	(Initial Class)	(Service Class)		(Initial Class)
2023 (Continued)								
Units purchased	146,714	1,330	3,713	88,873	112,187	722,388	302,182	5,936
Units withdrawn	(210,919)	(14,756)	(23,468)	(95,174)	(1,609,402)	(3,361,658)	(418,133)	(87,930)
Units transferred between Sub-Accounts and to/from the Fixed Account	11,110	13,997	(143)	(463)	(128,703)	(47,120)	9,054	8,354
Net increase (decrease)	(53,095)	571	(19,898)	(6,764)	(1,625,918)	(2,686,390)	(106,897)	(73,640)

7. NET INCREASE (DECREASE) IN OUTSTANDING UNITS (Continued)

	MML Income & Growth Sub-Account	MML Inflation- Protected and Income Sub-Account	MML Inflation- Protected and Income Sub-Account	MML International Equity Sub-Account	MML iShares® 60/40 Allocation Sub-Account	MML iShares® 80/20 Allocation Sub-Account	MML Large Cap Growth Sub-Account	MML Large Cap Growth Sub-Account
2023 (Continued)	(Service Class)	(Initial Class)	(Service Class)				(Initial Class)	(Service Class)
Units purchased	122,429	36,913	224,327	92,200	676,164	1,613,468	3,418	230,678
Units withdrawn	(198,813)	(961,935)	(551,259)	(73,434)	(18,734)	(52,155)	(54,796)	(97,369)
Units transferred between Sub-Accounts and to/from the Fixed Account	5,204	482,863	(10,199)	40,411	10,724	7,650	13,848	8,771
Net increase (decrease)	(71,180)	(442,159)	(337,131)	59,177	668,154	1,568,963	(37,530)	142,080

	MML Managed Bond Sub-Account	MML Managed Bond Sub-Account	MML Managed Volatility Sub-Account	MML Managed Volatility Sub-Account	MML Mid Cap Growth Sub-Account	MML Mid Cap Growth Sub-Account	MML Mid Cap Value Sub-Account	MML Mid Cap Value Sub-Account
2023 (Continued)	(Initial Class)	(Service Class)	(Initial Class)	(Service Class)	(Initial Class)	(Service Class)	(Initial Class)	(Service Class)
Units purchased	37,445	671,056	18,242	25,609	10,092	224,962	12,623	172,305
Units withdrawn	(751,475)	(2,809,634)	(483,656)	(252,460)	(127,368)	(472,611)	(310,361)	(356,864)
Units transferred between Sub-Accounts and to/from the Fixed Account	255,063	287,528	(19,780)	(16,229)	(12,082)	(1,369)	39,091	(7,239)
Net increase (decrease)	(458,967)	(1,851,050)	(485,194)	(243,080)	(129,358)	(249,018)	(258,647)	(191,798)

	MML Moderate Allocation Sub-Account	MML Moderate Allocation Sub-Account	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account	MML Small Cap Equity Sub-Account	MML Small Cap Growth Equity Sub-Account	MML Small Cap Growth Equity Sub-Account	MML Small Company Value Sub-Account
2023 (Continued)	(Initial Class)	(Service Class)		(Initial Class)	(Service Class)	(Initial Class)	(Service Class)	
Units purchased	42,339	829,091	457,051	3,438	117,688	127,110	44,529	53,541
Units withdrawn	(1,124,713)	(12,210,700)	(536,580)	(56,978)	(148,737)	(196,577)	(127,905)	(161,659)
Units transferred between Sub-Accounts and to/from the Fixed Account	9,732	(84,764)	35,697	(5,787)	(17,180)	62,034	368	321
Net increase (decrease)	(1,072,642)	(11,466,373)	(43,832)	(59,327)	(48,229)	(7,433)	(83,008)	(107,797)

	MML Small/Mid Cap Value Sub-Account	MML Small/Mid Cap Value Sub-Account	MML Strategic Emerging Markets Sub-Account	MML Sustainable Equity Sub-Account	MML Sustainable Equity Sub-Account	MML Total Return Bond Sub-Account	MML U.S. Government Money Market Sub-Account	PIMCO Commodity RealReturn® Strategy Sub-Account
2023 (Continued)	(Initial Class)	(Service Class)	(Service Class I)	(Initial Class)	(Service Class)			
Units purchased	12,019	69,380	74,073	8,021	75,324	365,993	1,789,357	18,945
Units withdrawn	(296,976)	(156,463)	(145,846)	(155,778)	(312,859)	(505,255)	(5,068,783)	(147,190)
Units transferred between Sub-Accounts and to/from the Fixed Account	25,019	13,652	9,728	(33,492)	(11,558)	49,594	1,218,644	(73,682)
Net increase (decrease)	(259,938)	(73,431)	(62,045)	(181,249)	(249,093)	(89,668)	(2,060,782)	(201,927)

7. NET INCREASE (DECREASE) IN OUTSTANDING UNITS (Continued)

	PIMCO Income Sub-Account	VY® CBRE Global Real Estate Sub-Account
2023 (Continued)		
Units purchased	118,671	7,316
Units withdrawn	(1,002)	(70,669)
Units transferred between Sub-Accounts and to/from the Fixed Account	5,193	6,190
Net increase (decrease)	122,862	(57,163)

Notes To Financial Statements (Continued)

7. NET INCREASE (DECREASE) IN OUTSTANDING UNITS (Continued)

	BlackRock 60/40 Target Allocation ETF V.I. Sub-Account	Delaware Ivy VIP Asset Strategy Sub-Account	Fidelity® VIP Contrafund® Sub-Account	Fidelity® VIP Contrafund® Sub-Account	Fidelity® VIP Healthcare Sub-Account	Fidelity® VIP Real Estate Sub-Account	Fidelity® VIP Strategic Income Sub-Account	Invesco Oppenheimer V.I. International Growth Sub-Account
2022	(Class III)	(Class II)	(Initial Class)	(Service Class 2)				(Series I)
Units purchased	152,856	73,114	34,154	686,645	44,996	18,312	23,316	10,582
Units withdrawn	(98,603)	(74,617)	(440,309)	(734,089)	(565)	(447)	(221)	(64,507)
Units transferred between Sub-Accounts and to/from the General Account	6,886	(6,556)	95,731	(55,817)	(711)	618	(939)	41,614
Net increase (decrease)	61,139	(8,059)	(310,424)	(103,261)	43,720	18,483	22,156	(12,311)
	Invesco Oppenheimer V.I. International Growth Sub-Account	Invesco V.I. Capital Appreciation Sub-Account	Invesco V.I. Capital Appreciation Sub-Account	Invesco V.I. Conservative Balanced Sub-Account	Invesco V.I. Conservative Balanced Sub-Account	Invesco V.I. Core Plus Bond Sub-Account	Invesco V.I. Discovery Mid Cap Growth Sub-Account	Invesco V.I. Discovery Mid Cap Growth Sub-Account
2022 (Continued)	(Series II)	(Series I)	(Series II)	(Series I)	(Series II)		(Series I)	(Series II)
Units purchased	93,064	18,373	3,541	677	-	1	18,077	124,521
Units withdrawn	(144,381)	(442,453)	(45,930)	(23,495)	(72)	(6,068)	(254,499)	(121,461)
Units transferred between Sub-Accounts and to/from the General Account	71,350	214,029	(18,303)	(983)	-	-	169,868	3,169
Net increase (decrease)	20,033	(210,051)	(60,692)	(23,801)	(72)	(6,067)	(66,554)	6,229
	Invesco V.I. Diversified Dividend Sub-Account	Invesco V.I. Diversified Dividend Sub-Account	Invesco V.I. Global Sub-Account	Invesco V.I. Global Sub-Account	Invesco V.I. Global Strategic Income Sub-Account	Invesco V.I. Global Strategic Income Sub-Account	Invesco V.I. Health Care Sub-Account	Invesco V.I. Health Care Sub-Account
2022 (Continued)	(Series I)	(Series II)	(Series I)	(Series II)	(Series I)	(Series II)	(Series I)	(Series II)
Units purchased	6,148	15,727	30,143	180,669	57,854	118,867	4,307	4,249
Units withdrawn	(26,249)	(152,663)	(426,707)	(296,147)	(984,562)	(480,763)	(26,210)	(42,235)
Units transferred between Sub-Accounts and to/from the General Account	6,676	24,658	335,751	50,656	(393,513)	(173,900)	1,163	487
Net increase (decrease)	(13,425)	(112,278)	(60,813)	(64,822)	(1,320,221)	(535,796)	(20,740)	(37,499)
	Invesco V.I. Main Street Sub-Account	Invesco V.I. Main Street Sub-Account	Invesco V.I. Technology Sub-Account	Invesco V.I. Technology Sub-Account	Invesco V.I. U.S. Government Money Sub-Account	Janus Henderson Global Technology and Innovation Sub-Account	MML Aggressive Allocation Sub-Account	MML Aggressive Allocation Sub-Account
2022 (Continued)	(Series I)	(Series II)	(Series I)	(Series II)			(Initial Class)	(Service Class)
Units purchased	5,152	50,874	8,978	1,801	11,506	31,947	23,284	129,010
Units withdrawn	(69,988)	(126,294)	(23,639)	(30,404)	(62,143)	(71)	(192,927)	(600,472)
Units transferred between Sub-Accounts and to/from the General Account	(12,632)	(3,300)	7,982	(3,904)	136,254	478	2,321	(39,388)
Net increase (decrease)	(77,468)	(78,720)	(6,679)	(32,507)	85,617	32,354	(167,322)	(510,850)

Notes To Financial Statements (Continued)

7. NET INCREASE (DECREASE) IN OUTSTANDING UNITS (Continued)

	MML American Funds Core Allocation Sub-Account	MML American Funds Growth Sub-Account	MML American Funds International Sub-Account	MML Balanced Allocation Sub-Account	MML Balanced Allocation Sub-Account	MML Blend Sub-Account	MML Blend Sub-Account	MML Blue Chip Growth Sub-Account
2022 (Continued)				(Initial Class)	(Service Class)	(Initial Class)	(Service Class)	(Initial Class)
Units purchased	1,114,004	715,509	127,178	29,189	846,081	14,990	945,670	7,673
Units withdrawn	(5,602,776)	(679,293)	(1,348,898)	(462,914)	(2,937,773)	(204,107)	(1,038,676)	(87,727)
Units transferred between Sub-Accounts and to/from the General Account	(153,891)	63,034	(2,353,997)	(23,163)	(197,548)	(12,556)	(32,115)	10,704
Net increase (decrease)	(4,642,663)	99,250	(3,575,717)	(456,888)	(2,289,240)	(201,673)	(125,121)	(69,350)

	MML Blue Chip Growth Sub-Account	MML Conservative Allocation Sub-Account	MML Conservative Allocation Sub-Account	MML Dynamic Bond Sub-Account	MML Equity Sub-Account	MML Equity Sub-Account	MML Equity Income Sub-Account	MML Equity Income Sub-Account
2022 (Continued)	(Service Class)	(Initial Class)	(Service Class)	(Service Class I)	(Initial Class)	(Service Class)	(Initial Class)	(Service Class)
Units purchased	548,850	38,166	980,597	164,011	10,151	177,319	26,269	348,570
Units withdrawn	(503,617)	(447,243)	(2,914,844)	(119,337)	(72,894)	(573,117)	(488,623)	(427,388)
Units transferred between Sub-Accounts and to/from the General Account	(21,438)	126,959	(9,780)	1,654	14,150	(30,849)	(371,358)	(33,877)
Net increase (decrease)	23,795	(282,118)	(1,944,027)	46,328	(48,593)	(426,647)	(833,712)	(112,695)

	MML Equity Index Sub-Account	MML Equity Index Sub-Account	MML Equity Momentum Sub-Account	MML Equity Rotation Sub-Account	MML Focused Equity Sub-Account	MML Foreign Sub-Account	MML Foreign Sub-Account	MML Fundamental Equity Sub-Account
2022 (Continued)	(Class I)	(Service Class I)	(Service Class I)	(Service Class I)		(Initial Class)	(Service Class)	
Units purchased	11,884	3,458	11,626	12,779	184,710	34,703	19,766	134,427
Units withdrawn	(92,681)	(165,521)	(104,587)	(20,346)	(135,861)	(769,869)	(56,860)	(125,640)
Units transferred between Sub-Accounts and to/from the General Account	(7,610)	(47,195)	(3,501)	(92)	21,419	218,756	169,222	11,135
Net increase (decrease)	(88,407)	(209,258)	(96,462)	(7,659)	70,268	(516,410)	132,128	19,922

	MML Fundamental Value Sub-Account	MML Global Sub-Account	MML Global Sub-Account	MML Global Sub-Account	MML Growth Allocation Sub-Account	MML Growth Allocation Sub-Account	MML High Yield Sub-Account	MML Income & Growth Sub-Account
2022 (Continued)		(Class I)	(Class II)	(Service Class I)	(Initial Class)	(Service Class)		(Initial Class)
Units purchased	257,437	1,165	3,590	183,965	143,855	922,206	206,954	8,622
Units withdrawn	(228,858)	(14,931)	(13,729)	(90,431)	(1,377,086)	(3,757,620)	(484,610)	(56,409)
Units transferred between Sub-Accounts and to/from the General Account	68,965	10,873	9,276	125,904	(290,695)	176,942	(13,060)	(18,186)
Net increase (decrease)	97,544	(2,893)	(863)	219,438	(1,523,926)	(2,658,472)	(290,716)	(65,973)

Notes To Financial Statements (Continued)

7. NET INCREASE (DECREASE) IN OUTSTANDING UNITS (Continued)

	MML Income & Growth Sub-Account	MML Inflation- Protected and Income Sub-Account	MML Inflation- Protected and Income Sub-Account	MML International Equity Sub-Account	MML iShares 60/40 Allocation Sub-Account	MML iShares 80/20 Allocation Sub-Account	MML Large Cap Growth Sub-Account	MML Large Cap Growth Sub-Account
2022 (Continued)	(Service Class)	(Initial Class)	(Service Class)				(Initial Class)	(Service Class)
Units purchased	134,010	52,107	568,183	143,411	576,599	2,122,312	4,996	98,725
Units withdrawn	(193,861)	(1,024,030)	(647,479)	(95,824)	(5,638)	(19,543)	(38,376)	(100,898)
Units transferred between Sub-Accounts and to/from the General Account	(27,744)	(484,883)	(17,061)	32,409	-	110	(9,148)	(2,947)
Net increase (decrease)	(87,595)	(1,456,806)	(96,357)	79,996	570,961	2,102,879	(42,528)	(5,120)

	MML Managed Bond Sub-Account	MML Managed Bond Sub-Account	MML Managed Volatility Sub-Account	MML Managed Volatility Sub-Account	MML Mid Cap Growth Sub-Account	MML Mid Cap Growth Sub-Account	MML Mid Cap Value Sub-Account	MML Mid Cap Value Sub-Account
2022 (Continued)	(Initial Class)	(Service Class)	(Initial Class)	(Service Class)	(Initial Class)	(Service Class)	(Initial Class)	(Service Class)
Units purchased	41,586	434,662	23,371	104,191	8,802	248,065	16,627	281,466
Units withdrawn	(780,898)	(2,443,028)	(503,517)	(237,883)	(111,618)	(412,031)	(305,889)	(311,590)
Units transferred between Sub-Accounts and to/from the General Account	(206,887)	(367,493)	(392,433)	(57,577)	(7,543)	17,663	(293,398)	(12,265)
Net increase (decrease)	(946,199)	(2,375,859)	(872,579)	(191,269)	(110,359)	(146,303)	(582,660)	(42,389)

	MML Moderate Allocation Sub-Account	MML Moderate Allocation Sub-Account	MML Short-Duration Bond Sub-Account	MML Small Cap Equity Sub-Account	MML Small Cap Equity Sub-Account	MML Small Cap Growth Equity Sub-Account	MML Small Cap Growth Equity Sub-Account	MML Small Company Value Sub-Account
2022 (Continued)	(Initial Class)	(Service Class)		(Initial Class)	(Service Class)	(Initial Class)	(Service Class)	
Units purchased	41,762	1,299,748	206,961	3,803	59,648	40,428	70,240	77,190
Units withdrawn	(1,110,602)	(11,029,528)	(687,131)	(61,546)	(135,008)	(194,640)	(131,357)	(131,363)
Units transferred between Sub-Accounts and to/from the General Account	21,347	(505,738)	322,828	(16,364)	18,204	35,390	(8,574)	11,056
Net increase (decrease)	(1,047,493)	(10,235,518)	(157,342)	(74,107)	(57,156)	(118,822)	(69,691)	(43,117)

	MML Small/Mid Cap Value Sub-Account	MML Small/Mid Cap Value Sub-Account	MML Special Situations Sub-Account	MML Strategic Emerging Markets Sub-Account	MML Sustainable Equity Sub-Account	MML Sustainable Equity Sub-Account	MML Total Return Bond Sub-Account	MML U.S. Government Money Market Sub-Account
2022 (Continued)	(Initial Class)	(Service Class)	(Service Class I)	(Service Class I)	(Initial Class)	(Service Class)		
Units purchased	17,619	105,501	4,075	109,057	11,173	101,663	281,935	4,210,643
Units withdrawn	(303,018)	(142,035)	(61,180)	(109,641)	(147,384)	(223,387)	(570,562)	(5,021,648)
Units transferred between Sub-Accounts and to/from the General Account	(47,784)	(2,530)	-	(12,719)	(25,354)	(11,107)	(97,868)	5,196,805
Net increase (decrease)	(333,183)	(39,064)	(57,105)	(13,303)	(161,565)	(132,831)	(386,495)	4,385,800

7. NET INCREASE (DECREASE) IN OUTSTANDING UNITS (Continued)

	PIMCO Commodity RealReturn® Strategy Sub-Account	PIMCO Income Sub-Account	VY® CBRE Global Real Estate Sub-Account
2022 (Continued)			
Units purchased	19,908	90,359	8,221
Units withdrawn	(190,221)	(261)	(74,763)
Units transferred between Sub-Accounts and to/from the General Account	162,183	(461)	4,924
Net increase (decrease)	(8,130)	89,637	(61,618)

8. FINANCIAL HIGHLIGHTS

- A. A summary of units outstanding, unit values, net assets, investment income ratios, expense ratios (excluding expenses of the underlying funds) and total return ratios for each of the years in the five-year period ended December 31, 2023 follows:

	At December 31,						For the Years Ended December 31,									
	Units		Unit Value ³ (Lowest to Highest)				Net Assets		Investment Income Ratio ¹		Expense Ratio ² (Lowest to Highest)			Total Return ³ (Lowest to Highest)		
BlackRock 60/40 Target Allocation ETF V.I. Sub-Account (Class III)																
2023	1,201,079	\$	14.69	to	\$	15.69	\$	18,823,486	1.91 %	1.00 %	to	1.80 %	13.26 %	to	14.17 %	
2022	1,196,331		12.97	to		13.40		16,425,190	1.90	1.00	to	1.80	(16.55)	to	(16.17)	
2021	1,135,192		15.55	to		16.33		18,530,683	2.15	1.00	to	1.80	9.71	to	10.59	
2020	603,542		14.17	to		14.77		8,908,234	1.89	1.00	to	1.80	12.31	to	13.21	
2019	274,313		12.62	to		13.05		3,575,830	4.15	1.00	to	1.80	19.06	to	20.02	
Cboe Vest U.S. Large Cap 10% Buffer Strategies V.I. Sub-Account ⁸																
2023	44,048		-	-		11.08		488,039	-	1.00	-	1.80	-	-	-	
Delaware Ivy VIP Asset Strategy Sub-Account (Class II)																
2023	760,284		13.09	to		14.41		11,089,050	2.11	1.00	to	3.10	10.47	to	12.81	
2022	833,323		11.85	to		12.77		10,874,142	1.57	1.00	to	3.10	(17.34)	to	(15.59)	
2021	841,382		14.34	to		15.13		13,346,595	1.55	1.00	to	3.10	7.07	to	9.34	
2020	904,514		13.39	to		13.84		13,270,558	2.02	1.00	to	3.10	10.40	to	12.74	
2019	943,855		12.13	to		12.27		12,403,360	2.13	1.00	to	3.10	18.06	to	20.57	
Fidelity® VIP Contrafund® Sub-Account (Initial Class)																
2023	3,269,827		41.22	to		66.62		187,411,670	0.46	0.95	to	2.60	30.04	to	32.19	
2022	3,876,930		31.70	to		50.39		168,304,213	0.49	0.95	to	2.60	(28.20)	to	(27.01)	
2021	4,187,353		44.15	to		69.04		250,765,962	0.06	0.95	to	2.60	24.56	to	26.63	
2020	4,994,284		35.45	to		54.52		237,247,151	0.24	0.95	to	2.60	27.22	to	29.33	
2019	6,319,467		27.86	to		42.16		232,111,397	0.45	0.95	to	2.60	28.20	to	30.33	
Fidelity® VIP Contrafund® Sub-Account (Service Class 2)																
2023	8,181,542		23.92	to		37.37		231,386,664	0.26	1.00	to	3.10	29.07	to	31.80	
2022	8,378,070		18.15	to		28.95		191,667,565	0.26	1.00	to	3.10	(28.73)	to	(27.22)	
2021	8,481,331		24.94	to		40.62		279,055,343	0.03	1.00	to	3.10	23.62	to	26.24	
2020	8,326,913		19.76	to		32.86		229,257,699	0.08	1.00	to	3.10	26.26	to	28.94	
2019	8,336,046		15.32	to		26.03		191,552,509	0.22	1.00	to	3.10	27.27	to	29.97	
Fidelity® VIP Health Care Sub-Account ⁷																
2023	101,885		-	-		10.50		1,069,597	-	1.00	to	3.10	-	-	2.67	
2022	43,720		-	-		10.22		447,027	-	1.00	to	3.10	-	-	-	
Fidelity VIP Overseas Portfolio (Service Class 2) ⁸																
2023	14,620		-	-		10.53		153,996	1.48	1.00	to	3.10	-	-	-	
Fidelity® VIP Real Estate Sub-Account ⁷																
2023	58,941		-	-		9.02		531,372	3.41	1.00	to	3.10	-	-	9.46	
2022	18,483		-	-		8.24		152,225	1.70	1.00	to	3.10	-	-	-	
Fidelity® VIP Strategic Income Sub-Account ⁷																
2023	71,420		-	-		9.78		698,753	7.82	0.95	to	3.10	-	-	7.77	
2022	22,156		-	-		9.08		201,143	6.33	0.95	to	3.10	-	-	-	
Invesco Oppenheimer V.I. International Growth Sub-Account (Series I)																
2023	740,991		21.25	to		32.39		21,214,036	0.58	0.95	to	2.60	17.97	to	19.92	
2022	845,645		18.01	to		27.01		20,298,479	-	0.95	to	2.60	(29.00)	to	(27.82)	
2021	857,957		25.37	to		37.42		28,738,025	-	0.95	to	2.60	7.39	to	9.18	
2020	1,029,713		23.62	to		34.27		32,043,570	0.93	0.95	to	2.60	18.38	to	20.35	
2019	1,267,445		19.95	to		28.48		32,768,962	1.05	0.95	to	2.60	25.30	to	27.39	

8. FINANCIAL HIGHLIGHTS (Continued)

At December 31,						For the Years Ended December 31,														
		Unit Value ³				Investment		Expense Ratio ²				Total Return ³								
Units		(Lowest to Highest)				Net Assets		Income Ratio ¹		(Lowest to Highest)				(Lowest to Highest)						
Invesco Oppenheimer V.I. International Growth Sub-Account (Series II)																				
2023	1,072,463	\$	13.43	to	\$	19.27	\$	20,333,526	0.30	%	1.00	%	to	3.10	%	16.97	%	to	19.44	%
2022	1,163,026		11.24	to		16.48		18,848,749	-		1.00	to	3.10			(29.39)	to	(27.89)		
2021	1,142,992		15.59	to		23.33		26,049,458	-		1.00	to	3.10			6.76	to	9.02		
2020	1,189,787		14.30	to		21.85		25,837,159	0.62		1.00	to	3.10			17.35	to	19.84		
2019	1,376,480		11.94	to		18.62		26,966,589	0.71		1.00	to	3.10			24.05	to	26.68		
Invesco V.I. Capital Appreciation Sub-Account (Series I)																				
2023	2,847,791		30.03	to		44.88		116,367,287	-		0.95	to	2.60			31.92	to	34.10		
2022	3,385,941		22.76	to		33.47		103,556,439	-		0.95	to	2.60			(32.56)	to	(31.44)		
2021	3,595,992		33.75	to		48.81		161,466,451	-		0.95	to	2.60			19.42	to	21.41		
2020	4,332,520		28.26	to		40.20		160,848,549	-		0.95	to	2.60			33.08	to	35.30		
2019	5,846,107		21.24	to		29.72		161,347,994	0.06		0.95	to	2.60			32.70	to	34.91		
Invesco V.I. Capital Appreciation Sub-Account (Series II)																				
2023	223,386		27.21	to		41.86		8,701,153	-		1.15	to	3.10			30.92	to	33.49		
2022	250,907		20.79	to		31.36		7,405,869	-		1.15	to	3.10			(33.07)	to	(31.75)		
2021	311,599		31.06	to		45.94		13,493,003	-		1.15	to	3.10			18.55	to	20.88		
2020	366,591		26.20	to		38.01		13,216,783	-		1.15	to	3.10			32.08	to	34.68		
2019	481,175		19.83	to		28.22		12,888,583	-		1.15	to	3.10			31.70	to	34.29		
Invesco V.I. Conservative Balanced Sub-Account (Series I) ⁵																				
2023	287,172		12.56	to		20.28		5,382,578	1.86		0.95	to	2.60			9.72	to	11.54		
2022	316,912		11.44	to		18.18		5,338,477	1.36		0.95	to	2.60			(18.99)	to	(17.64)		
2021	340,713		14.13	to		22.07		6,987,321	1.47		0.95	to	2.60			7.79	to	9.59		
2020	377,168		13.10	to		20.14		7,060,991	2.07		0.95	to	2.60			11.91	to	13.77		
2019	417,214		11.71	to		17.70		6,873,042	2.24		0.95	to	2.60			14.50	to	16.40		
Invesco V.I. Conservative Balanced Sub-Account (Series II)																				
2023	797		12.10	to		16.98		13,532	0.61		1.15	to	2.80			9.38	to	11.03		
2022	2,970		11.07	to		15.29		45,427	1.15		1.15	to	2.80			(19.19)	to	(17.97)		
2021	3,042		13.69	to		18.64		56,716	0.99		1.15	to	2.80			7.41	to	9.04		
2020	4,777		12.75	to		17.10		76,534	1.88		1.15	to	2.65			11.59	to	13.28		
2019	5,079		11.42	to		15.09		71,711	2.00		1.15	to	2.65			14.15	to	15.88		
Invesco V.I. Core Plus Bond Sub-Account ⁵																				
2023	94,073		-	-		14.29		1,344,454	2.60		-	-	1.40			-	-	4.67		
2022	103,980		-	-		13.65		1,419,773	1.93		-	-	1.40			-	-	(15.22)		
2021	110,047		-	-		16.11		1,772,416	2.05		-	-	1.40			-	-	(3.02)		
2020	120,583		-	-		16.61		2,002,482	3.09		-	-	1.40			-	-	8.18		
2019	129,518		-	-		15.35		1,988,167	3.32		-	-	1.40			-	-	8.00		
Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series I)																				
2023	2,017,336		29.03	to		42.42		72,492,489	-		0.95	to	2.60			10.26	to	12.08		
2022	2,145,143		26.33	to		37.84		69,315,183	-		0.95	to	2.60			(32.75)	to	(31.63)		
2021	2,211,697		39.15	to		55.35		105,647,787	-		0.95	to	2.60			16.04	to	17.97		
2020	2,592,033		33.74	to		46.92		106,383,035	0.04		0.95	to	2.60			37.08	to	39.36		
2019	3,582,421		24.61	to		33.67		106,476,690	-		0.95	to	2.60			35.79	to	38.05		
Invesco V.I. Discovery Mid Cap Growth Sub-Account (Series II)																				
2023	1,137,821		20.40	to		26.30		24,635,259	-		1.00	to	3.10			9.42	to	11.73		
2022	1,133,228		18.26	to		24.03		22,846,294	-		1.00	to	3.10			(33.23)	to	(31.82)		
2021	1,126,999		26.78	to		35.99		34,332,308	-		1.00	to	3.10			15.17	to	17.61		
2020	1,067,971		22.77	to		31.25		28,338,933	-		1.00	to	3.10			35.96	to	38.85		
2019	875,114		16.40	to		22.99		18,022,291	-		1.00	to	3.10			34.77	to	37.63		

8. FINANCIAL HIGHLIGHTS (Continued)

	At December 31,						For the Years Ended December 31,								
			Unit Value ³				Investment		Expense Ratio ²			Total Return ³			
	Units		(Lowest to Highest)		Net Assets		Income Ratio ¹		(Lowest to Highest)			(Lowest to Highest)			
Invesco V.I. Diversified Dividend Sub-Account (Series I)															
2023	282,594	\$	10.66	to	\$	17.09	\$	4,424,798	1.97 %	0.95 %	to	2.60 %	6.25 %	to	8.02 %
2022	317,837		10.04	to		15.82		4,603,701	1.89	0.95	to	2.60	(4.20)	to	(2.61)
2021	331,261		10.48	to		16.24		4,919,882	1.76	0.95	to	2.60	15.84	to	17.77
2020	483,803		9.04	to		13.79		6,302,426	3.18	0.95	to	2.60	(2.43)	to	(0.81)
2019	517,444		9.27	to		13.91		6,771,474	2.90	0.95	to	2.60	21.88	to	23.91
Invesco V.I. Diversified Dividend Sub-Account (Series II)															
2023	610,808		9.69	to		15.02		8,547,518	1.71	1.15	to	3.10	5.46	to	7.53
2022	728,781		9.19	to		13.97		9,489,706	1.58	1.15	to	3.10	(4.91)	to	(3.04)
2021	841,059		9.66	to		14.40		11,345,055	1.94	1.15	to	3.10	14.98	to	17.24
2020	945,327		8.40	to		12.29		10,939,473	2.70	1.15	to	3.10	(3.18)	to	(1.28)
2019	1,203,871		8.68	to		12.44		14,181,904	2.53	1.15	to	3.10	20.97	to	23.35
Invesco V.I. Global Sub-Account (Series I)															
2023	2,990,290		29.59	to		48.24		127,106,320	0.22	0.95	to	2.60	31.29	to	33.47
2022	3,633,296		22.54	to		36.14		115,923,743	-	0.95	to	2.60	(33.52)	to	(32.41)
2021	3,694,110		33.90	to		53.48		176,055,227	-	0.95	to	2.60	12.53	to	14.40
2020	4,227,403		30.13	to		46.75		176,607,524	0.67	0.95	to	2.60	24.36	to	26.43
2019	5,325,923		24.23	to		36.97		176,050,964	0.89	0.95	to	2.60	28.41	to	30.54
Invesco V.I. Global Sub-Account (Series II)															
2023	2,263,619		18.67	to		26.83		58,095,537	-	1.00	to	3.10	30.36	to	33.11
2022	2,506,424		14.03	to		20.58		49,427,513	-	1.00	to	3.10	(34.01)	to	(32.61)
2021	2,571,246		20.81	to		31.19		77,475,203	-	1.00	to	3.10	11.66	to	14.02
2020	2,759,316		18.25	to		27.94		75,781,828	0.44	1.00	to	3.10	23.45	to	26.07
2019	3,054,222		14.48	to		22.63		69,852,655	0.64	1.00	to	3.10	27.44	to	30.15
Invesco V.I. Global Strategic Income Sub-Account (Series I)															
2023	6,098,483		12.05	to		20.49		98,973,441	-	0.95	to	2.60	6.10	to	7.86
2022	6,982,530		11.36	to		18.99		105,617,322	-	0.95	to	2.60	(13.73)	to	(12.30)
2021	8,302,751		13.17	to		21.66		143,423,120	4.69	0.95	to	2.60	(5.89)	to	(4.33)
2020	8,478,804		13.99	to		22.64		154,124,943	5.81	0.95	to	2.60	0.75	to	2.42
2019	9,820,494		13.89	to		22.10		174,837,228	3.80	0.95	to	2.60	7.96	to	9.76
Invesco V.I. Global Strategic Income Sub-Account (Series II)															
2023	3,221,166		10.18	to		10.91		41,784,589	-	1.00	to	3.10	5.29	to	7.52
2022	3,523,347		9.46	to		10.36		42,908,119	-	1.00	to	3.10	(14.40)	to	(12.59)
2021	4,059,143		10.83	to		12.11		57,328,981	4.29	1.00	to	3.10	(6.51)	to	(4.52)
2020	4,076,835		11.34	to		12.95		61,117,704	5.16	1.00	to	3.10	(0.15)	to	1.97
2019	4,957,887		11.12	to		12.97		74,928,822	3.39	1.00	to	3.10	7.23	to	9.51
Invesco V.I. Health Care Sub-Account (Series I)															
2023	237,830		25.29	to		39.40		8,279,217	-	0.95	to	2.60	0.39	to	2.05
2022	261,340		25.20	to		38.61		8,993,115	-	0.95	to	2.60	(15.54)	to	(14.14)
2021	282,080		29.83	to		44.97		11,396,798	0.20	0.95	to	2.60	9.42	to	11.24
2020	309,109		27.26	to		40.42		11,325,826	0.31	0.95	to	2.60	11.52	to	13.38
2019	355,234		24.45	to		35.65		11,544,579	0.04	0.95	to	2.60	29.10	to	31.25
Invesco V.I. Health Care Sub-Account (Series II)															
2023	221,061		22.94	to		35.84		7,445,184	-	1.15	to	3.10	(0.36)	to	1.59
2022	260,608		23.02	to		35.28		8,644,331	-	1.15	to	3.10	(16.17)	to	(14.52)
2021	298,106		27.46	to		41.27		11,700,675	-	1.15	to	3.10	8.62	to	10.76
2020	350,828		25.28	to		37.26		12,414,240	0.09	1.15	to	3.10	10.71	to	12.89
2019	424,441		22.83	to		33.00		13,391,320	-	1.15	to	3.10	28.15	to	30.67

8. FINANCIAL HIGHLIGHTS (Continued)

At December 31,										For the Years Ended December 31,							
										Investment Income Ratio ¹		Expense Ratio ²			Total Return ³		
Units		Unit Value ³ (Lowest to Highest)				Net Assets				(Lowest to Highest)			(Lowest to Highest)				
Invesco V.I. Main Street Sub-Account (Series I)																	
2023	778,371	\$	29.06	to	\$	43.45	\$	29,488,977	0.83 %	0.95 %	to	2.60 %	20.07 %	to	22.06 %		
2022	862,445		24.21	to		35.60		26,861,840	1.45	0.95	to	2.60	(22.18)	to	(20.89)		
2021	939,913		31.10	to		45.00		37,181,449	0.70	0.95	to	2.60	24.30	to	26.36		
2020	1,047,878		25.02	to		35.61		33,044,884	1.49	0.95	to	2.60	11.02	to	12.87		
2019	1,159,288		22.54	to		31.55		32,594,095	1.06	0.95	to	2.60	28.69	to	30.83		
Invesco V.I. Main Street Sub-Account (Series II)																	
2023	881,293		20.38	to		26.34		20,291,673	0.49	1.00	to	3.10	19.09	to	21.61		
2022	990,269		16.76	to		22.12		18,959,328	1.09	1.00	to	3.10	(22.74)	to	(21.10)		
2021	1,068,989		21.24	to		28.63		26,323,196	0.52	1.00	to	3.10	23.35	to	25.97		
2020	1,040,875		16.86	to		23.21		21,292,780	1.17	1.00	to	3.10	10.22	to	12.56		
2019	1,022,590		14.98	to		21.06		19,582,090	0.81	1.00	to	3.10	27.72	to	30.43		
Invesco V.I. Technology Sub-Account (Series I)																	
2023	341,037		32.39	to		45.06		7,811,874	-	0.95	to	2.60	43.19	to	45.56		
2022	354,685		22.62	to		30.95		5,414,369	-	0.95	to	2.60	(41.49)	to	(40.52)		
2021	361,364		38.66	to		52.04		9,838,777	-	0.95	to	2.60	11.47	to	13.33		
2020	381,843		34.68	to		45.92		9,461,356	-	0.95	to	2.60	42.37	to	44.74		
2019	409,274		24.36	to		31.73		7,407,278	-	0.95	to	2.60	32.39	to	34.59		
Invesco V.I. Technology Sub-Account (Series II)																	
2023	181,352		29.36	to		51.98		8,322,967	-	1.15	to	3.10	42.26	to	45.05		
2022	203,958		20.64	to		35.84		6,511,762	-	1.15	to	3.10	(41.94)	to	(40.80)		
2021	236,464		35.55	to		60.54		12,810,416	-	1.15	to	3.10	10.60	to	12.77		
2020	274,028		32.15	to		53.68		13,181,326	-	1.15	to	3.10	41.35	to	44.13		
2019	300,092		22.74	to		37.25		10,156,434	-	1.15	to	3.10	31.42	to	34.01		
Invesco V.I. U.S. Government Money Sub-Account																	
2023	559,667		7.69	to		10.71		5,990,501	4.40	0.95	to	2.60	1.85	to	3.54		
2022	651,358		7.55	to		10.35		6,701,851	1.29	0.95	to	2.60	(1.31)	to	0.33		
2021	565,742		7.65	to		10.31		5,812,814	0.01	0.95	to	2.60	(2.56)	to	(0.94)		
2020	657,647		7.85	to		10.41		6,847,355	0.22	0.95	to	2.60	(2.35)	to	(0.73)		
2019	673,998		8.04	to		10.49		7,061,758	1.70	0.95	to	2.60	(0.90)	to	0.75		
Janus Henderson Global Technology and Innovation Sub-Account ⁷																	
2023	61,103		-	-		11.52		703,850	-	0.95	to	2.60	-	-	52.29		
2022	32,355		-	-		7.56		244,729	-	0.95	to	2.60	-	-	-		
MML Aggressive Allocation Sub-Account (Initial Class)																	
2023	1,027,797		20.74	to		26.98		26,625,090	2.88	0.95	to	2.60	15.29	to	17.20		
2022	1,192,000		17.99	to		23.02		26,453,572	2.02	0.95	to	2.60	(18.05)	to	(16.69)		
2021	1,359,322		21.95	to		27.63		36,316,920	1.25	0.95	to	2.60	13.65	to	15.54		
2020	1,451,095		19.32	to		23.92		33,588,339	1.67	0.95	to	2.60	10.44	to	12.27		
2019	1,821,022		17.49	to		21.30		37,508,768	1.99	0.95	to	2.60	20.75	to	22.76		
MML Aggressive Allocation Sub-Account (Service Class)																	
2023	3,406,635		17.08	to		18.62		70,495,980	2.61	1.00	to	3.10	14.38	to	16.80		
2022	3,789,915		14.63	to		16.28		68,477,846	1.81	1.00	to	3.10	(18.68)	to	(16.96)		
2021	4,300,766		17.61	to		20.02		95,058,178	1.03	1.00	to	3.10	12.85	to	15.25		
2020	4,774,344		15.28	to		17.74		93,600,335	1.38	1.00	to	3.10	9.63	to	11.95		
2019	5,325,759		13.65	to		16.18		95,636,402	1.71	1.00	to	3.10	19.87	to	22.42		

8. FINANCIAL HIGHLIGHTS (Continued)

	At December 31,						For the Years Ended December 31,							
			Unit Value ³				Investment				Total Return ³			
	Units		(Lowest to Highest)		Net Assets		Income Ratio ¹	Expense Ratio ²			(Lowest to Highest)			
MML American Funds Core Allocation Sub-Account														
2023	33,354,597	\$	15.77	to	\$	16.56	\$	658,413,694	3.79	%	1.00	%	to	13.24
2022	39,435,747		13.93	to		14.93		692,811,278	2.13		1.00		to	(14.56)
2021	44,078,410		16.30	to		17.84		919,106,679	1.31		1.00		to	11.73
2020	49,211,939		14.59	to		16.31		930,308,860	1.73		1.00		to	10.28
2019	57,034,873		13.23	to		15.10		989,500,489	2.39		1.00		to	16.94
MML American Funds Growth Sub-Account														
2023	7,531,821		29.35	to		36.72		234,932,146	1.43		1.00		to	36.59
2022	7,340,690		21.49	to		27.45		187,123,822	0.43		1.00		to	(30.98)
2021	7,241,440		31.13	to		40.62		282,628,214	-		1.00		to	20.34
2020	7,372,819		25.87	to		34.47		249,753,195	0.72		1.00		to	49.91
2019	8,104,921		17.26	to		23.48		191,745,889	0.32		1.00		to	28.93
MML American Funds International Sub-Account ⁶														
2023	-		-	-		-		-	-		-	-		-
2022	-		-	-		-		-	-		-	-		-
2021	3,575,717		13.26	to		14.27		57,592,722	0.13		1.00		to	(2.93)
2020	3,496,882		13.95	to		14.70		58,820,176	1.03		1.00		to	12.31
2019	4,069,542		12.69	to		13.09		61,510,006	2.74		1.00		to	21.09
MML Balanced Allocation Sub-Account (Initial Class)														
2023	2,873,841		15.42	to		20.06		54,442,079	3.13		0.95		to	11.41
2022	3,435,716		14.07	to		18.00		58,629,976	3.59		0.95		to	(15.53)
2021	3,892,604		16.93	to		21.31		78,951,185	1.25		0.95		to	8.94
2020	4,442,634		15.80	to		19.56		83,010,888	2.67		0.95		to	9.89
2019	5,809,475		14.62	to		17.80		99,026,168	2.57		0.95		to	15.65
MML Balanced Allocation Sub-Account (Service Class)														
2023	15,847,072		13.72	to		13.88		252,483,566	2.90		1.00		to	11.15
2022	18,387,696		12.34	to		12.75		267,376,596	3.34		1.00		to	(15.81)
2021	20,676,935		14.66	to		15.47		363,104,191	1.01		1.00		to	8.61
2020	22,692,373		13.50	to		14.54		373,173,046	2.42		1.00		to	9.54
2019	26,645,694		12.32	to		13.56		408,910,548	2.31		1.00		to	15.45
MML Blend Sub-Account (Initial Class)														
2023	1,626,991		23.88	to		36.34		50,812,477	1.69		0.95		to	16.51
2022	1,898,554		20.84	to		31.19		51,298,275	1.35		0.95		to	(17.38)
2021	2,100,227		25.64	to		37.75		68,982,917	2.11		0.95		to	13.94
2020	2,246,956		22.88	to		33.14		65,024,452	-		0.95		to	11.80
2019	2,419,280		20.81	to		29.64		62,980,806	2.43		0.95		to	20.23
MML Blend Sub-Account (Service Class)														
2023	10,381,369		16.66	to		21.65		187,651,135	1.45		1.00		to	16.16
2022	10,920,106		14.35	to		19.03		172,514,255	1.12		1.00		to	(17.63)
2021	11,045,227		17.42	to		23.60		217,290,953	1.97		1.00		to	13.60
2020	10,470,381		15.33	to		21.21		185,705,276	-		1.00		to	11.45
2019	9,995,211		13.76	to		19.44		161,858,732	2.20		1.00		to	19.87
MML Blue Chip Growth Sub-Account (Initial Class)														
2023	794,854		40.83	to		62.43		46,546,333	-		0.95		to	48.13
2022	930,051		28.02	to		42.15		37,019,588	-		0.95		to	(40.07)
2021	999,401		47.54	to		70.33		66,935,027	-		0.95		to	15.24
2020	1,113,935		41.94	to		61.03		64,905,396	-		0.95		to	33.13
2019	1,289,749		32.02	to		45.84		56,366,432	-		0.95		to	28.62

8. FINANCIAL HIGHLIGHTS (Continued)

	At December 31,						For the Years Ended December 31,								
							Investment						Total Return ³		
	Units		Unit Value ³ (Lowest to Highest)		Net Assets		Income Ratio ¹		Expense Ratio ² (Lowest to Highest)				(Lowest to Highest)		
MML Blue Chip Growth Sub-Account (Service Class)															
2023	5,915,497	\$	23.46	to	\$	37.00	\$	154,927,161	- %	1.00 %	to	3.10 %	44.56 %	to	47.61 %
2022	6,290,813		15.90	to		25.60		116,156,894	-	1.00	to	3.10	(41.49)	to	(40.25)
2021	6,267,018		26.60	to		43.75		203,462,318	-	1.00	to	3.10	12.54	to	14.92
2020	6,214,398		23.15	to		38.87		181,685,317	-	1.00	to	3.10	29.91	to	32.66
2019	5,915,556		17.45	to		29.92		137,333,697	-	1.00	to	3.10	25.60	to	28.27
MML Conservative Allocation Sub-Account (Initial Class)															
2023	2,694,952		14.54	to		18.91		48,661,190	3.24	0.95	to	2.60	8.80	to	10.60
2022	3,104,296		13.37	to		17.10		50,846,697	3.88	0.95	to	2.60	(16.92)	to	(15.54)
2021	3,386,413		16.09	to		20.25		65,736,943	1.18	0.95	to	2.60	5.81	to	7.57
2020	4,208,998		15.20	to		18.82		76,130,207	2.60	0.95	to	2.60	7.11	to	8.89
2019	4,480,056		14.19	to		17.29		74,794,028	2.68	0.95	to	2.60	12.24	to	14.11
MML Conservative Allocation Sub-Account (Service Class)															
2023	13,893,472		13.01	to		13.06		212,410,256	3.02	1.00	to	3.10	7.93	to	10.21
2022	16,606,296		11.80	to		12.10		232,816,753	3.59	1.00	to	3.10	(17.50)	to	(15.75)
2021	18,550,323		14.01	to		14.66		314,438,147	0.93	1.00	to	3.10	5.02	to	7.25
2020	21,085,898		13.06	to		13.96		338,139,060	2.48	1.00	to	3.10	6.32	to	8.58
2019	20,930,050		12.03	to		13.13		312,722,144	2.47	1.00	to	3.10	11.42	to	13.79
MML Dynamic Bond Sub-Account (Service Class I)															
2023	1,249,453		9.58	to		10.22		12,459,052	4.19	1.00	to	1.80	5.87	to	6.72
2022	1,265,675		9.05	to		9.58		11,894,741	3.60	1.00	to	1.80	(15.78)	to	(15.11)
2021	1,219,346		10.74	to		11.28		13,575,976	3.53	1.00	to	1.80	(1.96)	to	(1.18)
2020	1,102,442		10.96	to		11.42		12,453,262	0.34	1.00	to	1.80	1.67	to	2.48
2019	918,215		10.78	to		11.14		10,144,350	3.42	1.00	to	1.80	6.59	to	7.45
MML Equity Sub-Account (Initial Class)															
2023	720,763		24.30	to		37.06		21,776,249	2.11	0.95	to	2.60	6.53	to	8.29
2022	808,421		22.81	to		34.22		22,745,758	1.60	0.95	to	2.60	(7.09)	to	(5.55)
2021	857,014		24.55	to		36.23		25,600,018	1.66	0.95	to	2.60	26.92	to	29.03
2020	925,884		19.34	to		28.08		21,590,756	2.35	0.95	to	2.60	0.38	to	2.05
2019	1,097,055		19.27	to		27.51		25,084,965	2.04	0.95	to	2.60	22.69	to	24.73
MML Equity Sub-Account (Service Class)															
2023	3,418,217		18.29	to		22.03		78,993,261	1.85	1.00	to	3.10	5.73	to	7.97
2022	3,961,989		16.94	to		20.84		87,189,234	1.35	1.00	to	3.10	(7.78)	to	(5.83)
2021	4,388,637		17.99	to		22.60		104,959,878	1.47	1.00	to	3.10	25.97	to	28.64
2020	4,851,758		13.98	to		17.94		94,339,624	2.14	1.00	to	3.10	(0.37)	to	1.75
2019	4,923,227		13.74	to		18.01		97,057,943	1.82	1.00	to	3.10	21.78	to	24.36
MML Equity Income Sub-Account (Initial Class)															
2023	3,189,746		24.74	to		37.66		106,753,642	2.28	0.95	to	2.60	6.74	to	8.51
2022	3,643,121		23.18	to		34.71		112,868,269	1.68	0.95	to	2.60	(6.04)	to	(4.48)
2021	4,476,832		24.67	to		36.34		145,517,882	2.19	0.95	to	2.60	22.36	to	24.39
2020	5,424,458		20.16	to		29.21		141,959,006	2.46	0.95	to	2.60	(1.26)	to	0.38
2019	5,987,062		20.42	to		29.10		157,019,262	2.28	0.95	to	2.60	23.21	to	25.26
MML Equity Income Sub-Account (Service Class)															
2023	3,000,613		18.79	to		22.43		71,229,360	2.03	1.00	to	3.10	5.96	to	8.20
2022	3,463,599		17.37	to		21.17		78,411,916	1.51	1.00	to	3.10	(6.75)	to	(4.77)
2021	3,576,293		18.24	to		22.71		88,613,015	2.04	1.00	to	3.10	21.36	to	23.93
2020	3,974,069		14.72	to		18.71		82,700,285	2.20	1.00	to	3.10	(1.92)	to	0.16
2019	4,049,182		14.69	to		19.07		86,738,940	2.07	1.00	to	3.10	22.27	to	24.86

8. FINANCIAL HIGHLIGHTS (Continued)

At December 31,							For the Years Ended December 31,								
		Unit Value ³					Investment		Expense Ratio ²			Total Return ³			
Units		(Lowest to Highest)			Net Assets		Income Ratio ¹		(Lowest to Highest)			(Lowest to Highest)			
MML Equity Index Sub-Account (Class I)															
2023	792,661	\$	33.50	to	\$	50.53	\$	31,813,776	1.25 %	0.95 %	to	2.60 %	22.54 %	to	24.57 %
2022	855,314		27.34	to		40.56		27,821,852	1.01	0.95	to	2.60	(20.58)	to	(19.26)
2021	943,721		34.42	to		50.24		38,036,347	1.27	0.95	to	2.60	24.90	to	26.98
2020	1,036,338		27.56	to		39.57		32,974,512	1.64	0.95	to	2.60	15.03	to	16.94
2019	1,204,817		23.96	to		33.84		33,045,075	2.57	0.95	to	2.60	27.50	to	29.62
MML Equity Index Sub-Account (Service Class I)															
2023	616,130		30.37	to		46.07		27,437,454	0.97	1.15	to	3.10	21.63	to	24.01
2022	820,581		24.97	to		37.15		29,639,746	0.78	1.15	to	3.10	(21.17)	to	(19.61)
2021	1,029,840		31.67	to		46.21		46,175,143	1.15	1.15	to	3.10	23.96	to	26.40
2020	1,247,806		25.55	to		36.56		44,360,172	1.46	1.15	to	3.10	14.14	to	16.39
2019	1,507,010		22.38	to		31.41		45,972,770	2.57	1.15	to	3.10	26.57	to	29.06
MML Equity Momentum Sub-Account (Service Class I) ⁶															
2023	-		-	-		-		-	-	-	-	-	-	-	-
2022	-		-	-		-		-	-	-	-	-	-	-	-
2021	96,460		21.35	to		22.43		2,161,734	-	1.00	to	1.80	19.43	to	20.39
2020	109,941		17.88	to		18.63		2,048,092	0.01	1.00	to	1.80	17.86	to	18.81
2019	120,799		15.17	to		15.68		1,893,686	0.68	1.00	to	1.80	35.06	to	36.14
MML Equity Rotation Sub-Account (Service Class I)															
2023	81,036		22.38	to		23.89		1,683,451	1.40	1.00	to	1.80	18.47	to	19.42
2022	97,555		18.89	to		20.01		1,864,206	-	1.00	to	1.80	(15.99)	to	(15.31)
2021	105,214		22.49	to		23.63		2,484,746	0.43	1.00	to	1.80	25.72	to	26.73
2020	108,233		17.89	to		18.64		2,017,490	1.39	1.00	to	1.80	20.39	to	21.35
2019	113,361		14.86	to		15.36		1,741,305	0.19	1.00	to	1.80	14.22	to	15.14
MML Focused Equity Sub-Account															
2023	915,673		27.21	to		34.96		21,905,606	0.79	0.95	to	3.10	6.35	to	8.65
2022	936,219		25.58	to		32.17		21,586,709	0.63	0.95	to	3.10	(7.91)	to	(5.91)
2021	865,951		27.78	to		34.19		22,092,990	0.92	0.95	to	3.10	18.16	to	20.73
2020	881,782		23.51	to		28.32		18,957,860	0.64	0.95	to	3.10	9.10	to	11.47
2019	887,636		21.55	to		25.41		17,679,923	0.05	0.95	to	3.10	25.77	to	28.50
MML Foreign Sub-Account (Initial Class)															
2023	4,776,071		13.20	to		19.71		82,526,337	1.39	0.95	to	2.60	13.25	to	15.12
2022	5,925,578		11.66	to		17.12		89,435,726	3.71	0.95	to	2.60	(16.77)	to	(15.39)
2021	6,441,988		14.01	to		20.23		115,578,289	2.54	0.95	to	2.60	10.14	to	11.98
2020	7,346,537		12.72	to		18.07		118,344,969	3.10	0.95	to	2.60	3.21	to	4.93
2019	8,271,919		12.32	to		17.22		128,108,301	1.79	0.95	to	2.60	10.26	to	12.10
MML Foreign Sub-Account (Service Class)															
2023	594,680		11.91	to		11.98		9,248,287	1.21	1.00	to	3.10	12.44	to	14.82
2022	652,319		10.37	to		10.65		8,823,408	3.38	1.00	to	3.10	(17.47)	to	(15.72)
2021	520,191		12.30	to		12.91		8,065,680	2.30	1.00	to	3.10	9.51	to	11.83
2020	584,504		11.00	to		11.79		8,319,183	2.84	1.00	to	3.10	2.34	to	4.52
2019	700,188		10.52	to		11.52		9,815,416	1.52	1.00	to	3.10	9.34	to	11.66
MML Fundamental Equity Sub-Account															
2023	908,537		27.67	to		35.56		21,435,172	0.76	0.95	to	3.10	19.02	to	21.60
2022	909,971		23.25	to		29.24		18,740,713	0.36	0.95	to	3.10	(22.86)	to	(21.19)
2021	890,049		30.14	to		37.10		23,979,880	0.33	0.95	to	3.10	23.50	to	26.18
2020	880,974		24.41	to		29.41		19,006,450	-	0.95	to	3.10	15.94	to	18.46
2019	797,684		21.05	to		24.82		14,803,275	0.44	0.95	to	3.10	29.26	to	32.07

Notes To Financial Statements (Continued)

8. FINANCIAL HIGHLIGHTS (Continued)

At December 31,							For the Years Ended December 31,									
							Investment									
							Income	Expense Ratio ²				Total Return ³				
							Ratio ¹	(Lowest to Highest)				(Lowest to Highest)				
Units							(Lowest to Highest)							Net Assets		
MML Fundamental Value Sub-Account																
2023	1,160,477	\$	20.49	to	\$	26.33	\$	21,398,547	1.12 %	0.95 %	to	3.10 %	9.96 %	to	12.34 %	
2022	1,213,572		18.63	to		23.44		20,630,720	0.84	0.95	to	3.10	(7.92)	to	(5.92)	
2021	1,116,028		20.24	to		24.91		20,520,581	1.64	0.95	to	3.10	25.73	to	28.46	
2020	1,019,772		16.10	to		19.39		14,865,608	1.08	0.95	to	3.10	(0.76)	to	1.40	
2019	1,016,383		16.22	to		19.12		15,050,102	1.71	0.95	to	3.10	18.75	to	21.33	
MML Global Sub-Account (Class I)																
2023	182,051		18.83	to		26.62		4,644,062	0.91	0.95	to	2.60	11.58	to	13.43	
2022	181,481		16.87	to		23.47		4,097,127	1.46	0.95	to	2.60	(19.89)	to	(18.56)	
2021	184,374		21.06	to		28.82		5,128,057	0.88	0.95	to	2.60	14.31	to	16.21	
2020	214,433		18.43	to		24.80		5,164,484	1.09	0.95	to	2.60	11.09	to	12.94	
2019	266,210		16.59	to		21.96		5,717,821	0.68	0.95	to	2.60	27.24	to	29.36	
MML Global Sub-Account (Class II)																
2023	224,321		15.23	to		19.66		4,141,451	0.82	1.18	to	1.65	12.51	to	13.03	
2022	244,219		13.47	to		17.48		3,976,403	1.63	1.18	to	1.65	(19.06)	to	(18.68)	
2021	245,084		16.57	to		21.59		4,977,478	0.90	1.18	to	1.65	15.50	to	16.05	
2020	256,171		14.28	to		18.69		4,487,312	1.05	1.18	to	1.65	12.10	to	12.63	
2019	274,411		12.68	to		16.68		4,316,103	0.60	1.18	to	1.65	28.45	to	29.05	
MML Global Sub-Account (Service Class I)																
2023	1,101,260		17.13	to		17.42		21,339,873	0.82	1.00	to	3.10	10.61	to	12.95	
2022	1,108,024		15.42	to		15.49		19,626,341	1.34	1.00	to	3.10	(20.50)	to	(18.81)	
2021	888,586		19.00	to		19.48		19,462,328	0.76	1.00	to	3.10	13.58	to	15.99	
2020	924,023		16.38	to		17.15		18,084,268	0.90	1.00	to	3.10	10.23	to	12.57	
2019	944,518		14.55	to		15.56		17,104,721	0.35	1.00	to	3.10	26.30	to	28.98	
MML Growth Allocation Sub-Account (Initial Class)																
2023	12,416,012		18.69	to		24.31		285,644,226	2.92	0.95	to	2.60	13.01	to	14.89	
2022	14,041,930		16.54	to		21.16		282,056,598	2.65	0.95	to	2.60	(17.47)	to	(16.10)	
2021	15,565,856		20.04	to		25.22		373,971,831	1.56	0.95	to	2.60	11.40	to	13.25	
2020	18,484,124		17.99	to		22.27		393,392,881	2.15	0.95	to	2.60	9.87	to	11.69	
2019	26,884,888		16.37	to		19.94		514,011,956	2.27	0.95	to	2.60	18.10	to	20.06	
MML Growth Allocation Sub-Account (Service Class)																
2023	28,790,959		15.84	to		16.83		604,769,485	2.68	1.00	to	3.10	12.30	-	14.68	
2022	31,477,349		13.81	to		14.99		583,718,812	2.38	1.00	to	3.10	(18.03)	to	(16.29)	
2021	34,135,820		16.50	to		18.28		763,512,275	1.29	1.00	to	3.10	10.45	to	12.79	
2020	39,460,627		14.63	to		16.55		788,648,224	1.88	1.00	to	3.10	9.04	to	11.35	
2019	53,783,791		13.13	to		15.18		978,800,276	2.03	1.00	to	3.10	17.24	to	19.73	
MML High Yield Sub-Account																
2023	2,723,099		14.48	to		19.42		39,426,819	6.72	0.95	to	3.10	9.38	to	11.75	
2022	2,829,996		13.24	to		17.38		37,488,508	7.26	0.95	to	3.10	(14.65)	to	(12.80)	
2021	3,120,712		15.51	to		19.93		48,073,933	8.60	0.95	to	3.10	4.59	to	6.86	
2020	2,894,882		14.83	to		18.65		42,643,144	0.02	0.95	to	3.10	2.16	to	4.38	
2019	2,982,701		14.52	to		17.87		43,189,753	6.00	0.95	to	3.10	8.45	to	10.80	
MML Income & Growth Sub-Account (Initial Class)																
2023	638,019		22.89	to		35.50		20,337,081	2.10	0.95	to	2.60	6.40	to	8.16	
2022	711,659		21.51	to		32.82		21,115,105	1.46	0.95	to	2.60	(2.87)	to	(1.25)	
2021	777,632		22.15	to		33.24		23,466,564	1.74	0.95	to	2.60	23.03	to	25.08	
2020	893,631		18.00	to		26.57		21,695,092	2.03	0.95	to	2.60	0.38	to	2.05	
2019	1,014,616		17.93	to		26.04		24,198,302	1.99	0.95	to	2.60	21.24	to	23.26	

8. FINANCIAL HIGHLIGHTS (Continued)

At December 31,							For the Years Ended December 31,								
		Unit Value ³						Investment		Expense Ratio ²			Total Return ³		
Units		(Lowest to Highest)				Net Assets		Income Ratio ¹		(Lowest to Highest)			(Lowest to Highest)		
MML Income & Growth Sub-Account (Service Class)															
2023	1,338,100	\$	19.16	to	\$	20.77	\$	28,235,679	1.89 %	1.00 %	to	3.10 %	5.66 %	to	7.90 %
2022	1,409,280		17.75	to		19.65		28,418,303	1.23	1.00	to	3.10	(3.62)	to	(1.58)
2021	1,496,875		18.04	to		20.39		31,561,723	1.61	1.00	to	3.10	22.10	to	24.69
2020	1,567,693		14.47	to		16.70		27,009,775	1.83	1.00	to	3.10	(0.35)	to	1.76
2019	1,681,966		14.22	to		16.76		29,439,298	1.78	1.00	to	3.10	20.35	to	22.90
MML Inflation-Protected and Income Sub-Account (Initial Class)															
2023	6,094,042		10.85	to		16.16		86,114,635	4.62	0.95	to	2.60	2.73	to	4.44
2022	6,536,201		10.56	to		15.48		88,867,535	2.51	0.95	to	2.60	(15.57)	to	(14.17)
2021	7,993,007		12.51	to		18.03		126,908,902	1.07	0.95	to	2.60	3.67	to	5.39
2020	8,662,812		12.07	to		17.11		130,964,666	0.11	0.95	to	2.60	8.26	to	10.06
2019	9,934,572		11.15	to		15.54		137,121,414	2.38	0.95	to	2.60	5.53	to	7.29
MML Inflation-Protected and Income Sub-Account (Service Class)															
2023	3,388,684		9.82	to		11.16		40,118,864	4.34	1.00	to	3.10	1.85	to	4.01
2022	3,725,815		9.64	to		10.73		43,115,577	2.41	1.00	to	3.10	(16.22)	to	(14.45)
2021	3,822,173		11.51	to		12.54		52,995,919	0.86	1.00	to	3.10	2.88	to	5.06
2020	3,431,376		11.19	to		11.94		46,199,752	0.11	1.00	to	3.10	7.49	to	9.77
2019	3,451,539		10.41	to		10.88		43,237,327	2.22	1.00	to	3.10	4.76	to	6.98
MML International Equity Sub-Account															
2023	759,728		10.10	-		12.43		9,683,383	1.14	0.95	to	3.10	14.68	-	17.16
2022	700,551		8.80	to		10.61		7,786,105	0.84	0.95	to	3.10	(17.93)	to	(16.15)
2021	620,555		10.73	to		12.65		8,307,912	0.50	0.95	to	3.10	8.09	to	10.44
2020	562,014		9.92	to		11.45		6,833,772	3.20	0.95	to	3.10	1.86	to	4.07
2019	571,549		9.74	to		11.01		6,643,432	1.79	0.95	to	3.10	20.55	to	23.17
MML iShares® 60/40 Allocation Sub-Account ⁷															
2023	1,239,115		-	-		10.09		12,501,315	2.23	0.95	to	3.10	-	-	13.51
2022	570,961		-	-		8.89		5,074,791	2.14	0.95	to	3.10	-	-	-
MML iShares® 80/20 Allocation Sub-Account ⁷															
2023	3,671,842		-	-		10.34		37,951,462	1.69	0.95	to	3.10	-	-	16.70
2022	2,102,879		-	-		8.86		18,624,545	2.12	0.95	to	3.10	-	-	-
MML Large Cap Growth Sub-Account (Initial Class)															
2023	348,658		34.35	to		50.94		15,238,937	-	0.95	to	2.60	47.83	to	50.28
2022	386,186		23.24	to		33.90		11,258,538	-	0.95	to	2.60	(29.41)	to	(28.23)
2021	428,715		32.92	to		47.24		17,656,357	0.05	0.95	to	2.60	15.38	to	17.30
2020	492,342		28.53	to		40.27		17,478,633	0.33	0.95	to	2.60	28.40	to	30.53
2019	577,917		22.22	to		30.85		15,827,567	0.58	0.95	to	2.60	28.60	to	30.74
MML Large Cap Growth Sub-Account (Service Class)															
2023	1,115,328		26.60	to		31.12		28,781,766	-	1.00	to	3.10	46.77	to	49.87
2022	973,248		17.75	to		21.21		17,964,547	-	1.00	to	3.10	(29.94)	to	(28.45)
2021	978,368		24.81	to		30.27		25,898,086	-	1.00	to	3.10	14.48	to	16.91
2020	965,919		21.22	to		26.44		22,228,571	0.17	1.00	to	3.10	27.52	to	30.22
2019	896,562		16.30	to		20.73		16,390,792	0.46	1.00	to	3.10	27.64	to	30.35
MML Managed Bond Sub-Account (Initial Class)															
2023	4,749,269		11.47	to		17.93		73,150,962	3.97	0.95	to	2.60	3.97	to	5.69
2022	5,208,236		11.03	to		16.96		76,373,788	3.00	0.95	to	2.60	(17.19)	to	(15.81)
2021	6,154,434		13.32	to		20.15		107,430,616	3.16	0.95	to	2.60	(1.77)	to	(0.14)
2020	6,518,330		13.56	to		20.18		114,405,900	0.10	0.95	to	2.60	4.95	to	6.69
2019	7,123,945		12.92	to		18.91		117,808,474	3.67	0.95	to	2.60	6.99	to	8.77

8. FINANCIAL HIGHLIGHTS (Continued)

At December 31,						For the Years Ended December 31,														
		Unit Value ³				Investment		Expense Ratio ²				Total Return ³								
Units		(Lowest to Highest)				Net Assets		Income Ratio ¹		(Lowest to Highest)				(Lowest to Highest)						
MML Managed Bond Sub-Account (Service Class)																				
2023	13,114,910	\$	10.27	to	\$	10.40	\$	163,963,276	3.67	%	1.00	%	to	3.10	%	3.19	%	to	5.38	%
2022	14,965,961		9.75	to		10.08		180,957,384	2.73		1.00	to	3.10		(17.80)	to		(16.06)		
2021	17,341,820		11.61	to		12.26		253,912,380	2.96		1.00	to	3.10		(2.51)	to		(0.44)		
2020	17,765,196		11.66	to		12.58		266,777,188	0.10		1.00	to	3.10		4.16	to		6.37		
2019	18,130,096		10.96	to		12.07		260,703,020	3.46		1.00	to	3.10		6.19	to		8.45		
MML Managed Volatility Sub-Account (Initial Class)																				
2023	3,212,163		14.28	to		23.07		61,463,479	0.57		0.95	to	2.60		9.98	to		11.81		
2022	3,697,357		12.98	to		20.63		63,499,565	0.47		0.95	to	2.60		(14.30)	to		(12.88)		
2021	4,569,936		15.15	to		23.68		90,531,793	0.97		0.95	to	2.60		8.68	to		10.49		
2020	5,170,638		13.94	to		21.43		93,221,623	1.40		0.95	to	2.60		3.94	to		5.67		
2019	5,894,344		13.41	to		20.28		101,210,212	1.62		0.95	to	2.60		9.03	to		10.84		
MML Managed Volatility Sub-Account (Service Class)																				
2023	1,055,623		12.90	to		12.95		17,363,284	0.27		1.00	to	3.10		9.16	to		11.47		
2022	1,298,703		11.57	to		11.86		19,279,858	0.19		1.00	to	3.10		(14.94)	to		(13.14)		
2021	1,489,972		13.32	to		13.94		25,981,811	0.71		1.00	to	3.10		7.87	to		10.16		
2020	1,669,075		12.09	to		12.93		26,903,885	1.15		1.00	to	3.10		3.17	to		5.36		
2019	1,951,793		11.48	to		12.53		30,590,858	1.37		1.00	to	3.10		8.21	to		10.51		
MML Mid Cap Growth Sub-Account (Initial Class)																				
2023	1,006,915		34.24	to		70.83		61,848,174	-		0.95	to	2.60		19.50	to		21.48		
2022	1,136,273		28.65	to		58.31		57,562,324	-		0.95	to	2.60		(27.03)	to		(25.82)		
2021	1,246,633		39.26	to		78.60		85,664,131	-		0.95	to	2.60		10.31	to		12.14		
2020	1,454,733		35.60	to		70.09		89,949,266	0.08		0.95	to	2.60		22.35	to		24.38		
2019	1,710,217		29.09	to		56.35		83,592,878	0.02		0.95	to	2.60		27.93	to		30.05		
MML Mid Cap Growth Sub-Account (Service Class)																				
2023	3,484,460		20.16	to		30.88		87,758,884	-		1.00	to	3.10		18.61	to		21.12		
2022	3,733,478		16.65	to		26.04		81,046,753	-		1.00	to	3.10		(27.59)	to		(26.05)		
2021	3,879,781		22.51	to		35.95		118,152,584	-		1.00	to	3.10		9.54	to		11.87		
2020	4,168,210		20.12	to		32.82		117,785,877	-		1.00	to	3.10		21.43	to		24.01		
2019	4,497,792		16.23	to		27.03		108,799,560	-		1.00	to	3.10		27.01	to		29.71		
MML Mid Cap Value Sub-Account (Initial Class)																				
2023	2,178,707		32.35	to		51.94		97,900,075	2.60		0.95	to	2.60		3.26	to		4.97		
2022	2,437,354		31.33	to		49.48		104,763,063	2.02		0.95	to	2.60		(3.86)	to		(2.26)		
2021	3,020,014		32.59	to		50.63		132,262,516	1.40		0.95	to	2.60		20.15	to		22.15		
2020	3,707,481		27.13	to		41.45		133,181,143	1.82		0.95	to	2.60		(0.90)	to		0.75		
2019	4,044,150		27.37	to		41.14		144,980,289	1.62		0.95	to	2.60		25.82	to		27.91		
MML Mid Cap Value Sub-Account (Service Class)																				
2023	2,015,747		18.00	to		29.33		46,054,106	2.40		1.00	to	3.10		2.48	to		4.65		
2022	2,207,545		17.20	to		28.62		50,303,554	1.88		1.00	to	3.10		(4.56)	to		(2.54)		
2021	2,249,934		17.65	to		29.98		55,688,323	1.25		1.00	to	3.10		19.20	to		21.72		
2020	2,406,081		14.50	to		25.16		51,269,948	1.58		1.00	to	3.10		(1.62)	to		0.47		
2019	2,380,279		14.43	to		25.57		53,222,998	1.44		1.00	to	3.10		24.97	to		27.62		
MML Moderate Allocation Sub-Account (Initial Class)																				
2023	7,711,185		16.67	to		21.68		159,162,925	3.30		0.95	to	2.60		10.98	to		12.82		
2022	8,783,827		15.02	to		19.21		161,103,074	3.27		0.95	to	2.60		(17.15)	to		(15.78)		
2021	9,831,320		18.13	to		22.81		214,743,239	1.34		0.95	to	2.60		9.12	to		10.94		
2020	11,897,524		16.61	to		20.57		235,097,461	2.55		0.95	to	2.60		7.71	to		9.50		
2019	17,179,709		15.42	to		18.78		310,792,789	2.52		0.95	to	2.60		15.54	to		17.46		

8. FINANCIAL HIGHLIGHTS (Continued)

At December 31,						For the Years Ended December 31,									
		Unit Value ³				Investment		Expense Ratio ²			Total Return ³				
Units		(Lowest to Highest)				Net Assets		Income Ratio ¹		(Lowest to Highest)			(Lowest to Highest)		
MML Moderate Allocation Sub-Account (Service Class)															
2023	52,943,371	\$	14.44	to	\$	14.99	\$	956,025,249	2.99 %	1.00 %	to	3.10 %	10.16 %	to	12.50 %
2022	64,409,744		12.83	to		13.60		1,044,498,635	2.96	1.00	to	3.10	(17.71)	to	(15.96)
2021	74,645,263		15.27	to		16.53		1,461,000,467	1.11	1.00	to	3.10	8.26	to	10.56
2020	87,882,437		13.81	to		15.27		1,575,429,932	2.23	1.00	to	3.10	6.80	to	9.07
2019	105,177,875		12.66	to		14.30		1,752,110,801	2.26	1.00	to	3.10	14.75	to	17.18
MML Short-Duration Bond Sub-Account															
2023	2,987,098		8.21	to		11.01		30,357,722	3.37	0.95	to	3.10	3.45	to	5.70
2022	3,030,930		7.94	to		10.42		29,348,995	3.02	0.95	to	3.10	(10.80)	to	(8.86)
2021	3,188,272		8.90	to		11.43		34,025,850	2.93	0.95	to	3.10	(1.41)	to	0.73
2020	4,150,563		9.03	to		11.35		44,272,880	-	0.95	to	3.10	(1.75)	to	0.39
2019	3,025,222		9.19	to		11.31		32,173,643	3.11	0.95	to	3.10	0.99	to	3.19
MML Small Cap Equity Sub-Account (Initial Class)															
2023	489,705		29.28	to		46.69		22,205,417	1.28	0.95	to	2.60	14.80	to	16.70
2022	549,032		25.50	to		40.01		21,412,816	0.71	0.95	to	2.60	(18.04)	to	(16.67)
2021	623,139		31.11	to		48.02		29,197,903	0.44	0.95	to	2.60	19.60	to	21.59
2020	706,873		26.01	to		39.49		27,259,529	0.53	0.95	to	2.60	17.60	to	19.55
2019	831,548		22.12	to		33.03		26,710,657	0.47	0.95	to	2.60	23.22	to	25.27
MML Small Cap Equity Sub-Account (Service Class)															
2023	1,093,197		20.29	to		26.49		25,292,942	1.04	1.00	to	3.10	13.94	to	16.35
2022	1,141,426		17.44	to		23.25		23,617,332	0.43	1.00	to	3.10	(18.65)	to	(16.92)
2021	1,198,581		20.99	to		28.58		30,289,216	0.27	1.00	to	3.10	18.71	to	21.23
2020	1,169,902		17.31	to		24.08		25,344,927	0.30	1.00	to	3.10	16.72	to	19.20
2019	1,184,188		14.53	to		20.63		22,694,629	0.26	1.00	to	3.10	22.30	to	24.89
MML Small Cap Growth Equity Sub-Account (Initial Class)															
2023	1,504,269		33.20	to		56.35		64,463,437	-	0.95	to	2.60	13.85	to	15.74
2022	1,511,703		29.16	to		48.69		60,413,373	-	0.95	to	2.60	(25.13)	to	(23.88)
2021	1,630,525		38.94	to		63.96		87,699,978	-	0.95	to	2.60	4.55	to	6.29
2020	1,790,589		37.25	to		60.18		90,992,101	-	0.95	to	2.60	32.15	to	34.34
2019	2,488,164		28.19	to		44.79		94,744,872	-	0.95	to	2.60	30.88	to	33.06
MML Small Cap Growth Equity Sub-Account (Service Class)															
2023	943,464		20.40	to		30.09		23,420,809	-	1.00	to	3.10	13.00	to	15.39
2022	1,026,472		17.68	to		26.63		22,649,920	-	1.00	to	3.10	(25.69)	to	(24.11)
2021	1,096,162		23.30	to		35.83		32,664,648	-	1.00	to	3.10	3.77	to	5.98
2020	1,072,366		21.98	to		34.53		31,164,764	-	1.00	to	3.10	31.16	to	33.94
2019	1,127,320		16.41	to		26.33		26,026,111	-	1.00	to	3.10	29.90	to	32.66
MML Small Company Value Sub-Account															
2023	1,095,035		18.95	to		30.20		24,402,246	0.86	1.00	to	3.10	12.39	to	14.77
2022	1,202,832		16.51	to		26.87		23,768,684	-	1.00	to	3.10	(17.65)	to	(15.90)
2021	1,245,949		19.64	to		32.63		29,889,996	0.19	1.00	to	3.10	21.30	to	23.88
2020	1,280,052		15.85	to		26.90		25,549,702	0.06	1.00	to	3.10	5.60	to	7.84
2019	1,254,816		14.70	to		25.47		24,665,122	0.08	1.00	to	3.10	21.43	to	24.01
MML Small/Mid Cap Value Sub-Account (Initial Class)															
2023	2,046,774		26.61	to		51.75		74,277,443	1.09	0.95	to	2.60	14.13	to	16.02
2022	2,306,713		23.31	to		44.60		72,429,647	1.24	0.95	to	2.60	(17.85)	to	(16.49)
2021	2,639,896		28.38	to		53.41		99,423,759	1.01	0.95	to	2.60	32.46	to	34.66
2020	3,498,522		21.43	to		39.66		97,698,172	1.10	0.95	to	2.60	1.96	to	3.66
2019	3,898,914		21.01	to		38.26		105,702,814	0.61	0.95	to	2.60	17.19	to	19.14

8. FINANCIAL HIGHLIGHTS (Continued)

	At December 31,							For the Years Ended December 31,							
	Units		Unit Value ³ (Lowest to Highest)			Net Assets		Investment Income Ratio ¹		Expense Ratio ² (Lowest to Highest)			Total Return ³ (Lowest to Highest)		
MML Small/Mid Cap Value Sub-Account (Service Class)															
2023	1,126,743	\$	17.82	to	\$	24.13	\$	24,597,903	0.85 %	1.00 %	to	3.10 %	13.33 %	to	15.73 %
2022	1,200,173		15.40	to		21.29		23,433,475	1.00	1.00	to	3.10	(18.46)	to	(16.73)
2021	1,239,236		18.50	to		26.11		29,944,498	0.88	1.00	to	3.10	31.51	to	34.29
2020	1,139,563		13.77	to		19.86		22,292,450	0.84	1.00	to	3.10	1.14	to	3.29
2019	1,156,012		13.34	to		19.63		23,286,750	0.39	1.00	to	3.10	16.32	to	18.78
MML Special Situations Sub-Account (Service Class I) ⁶															
2023	-		-	-		-		-	-	-	-	-	-	-	-
2022	-		-	-		-		-	-	-	-	-	-	-	-
2021	57,104		18.03	to		18.94		1,081,248	-	1.00	to	1.80	(0.39)	to	0.41
2020	50,391		18.10	to		18.87		950,460	0.03	1.00	to	1.80	26.93	to	27.95
2019	56,690		14.26	to		14.75		835,745	-	1.00	to	1.80	21.29	to	22.27
MML Strategic Emerging Markets Sub-Account (Service Class I)															
2023	986,758		8.31	to		11.83		11,198,336	-	1.00	to	3.10	0.07	to	0.09
2022	1,048,803		7.77	to		10.83		10,939,529	0.03	1.00	to	3.10	(0.29)	to	(0.28)
2021	1,062,107		10.95	to		14.95		15,351,011	-	1.00	to	3.10	(11.15)	to	(9.26)
2020	1,017,814		12.33	to		16.47		16,215,171	0.20	1.00	to	3.10	13.68	to	16.09
2019	1,150,619		10.84	to		14.19		15,739,019	0.01	1.00	to	3.10	21.36	to	23.93
MML Sustainable Equity Sub-Account (Initial Class) ⁴															
2023	1,321,303		27.34	to		49.99		59,757,622	0.96	0.95	to	2.60	21.32	to	23.33
2022	1,502,553		22.54	to		40.53		55,237,374	0.94	0.95	to	2.60	(19.14)	to	(17.80)
2021	1,664,117		27.87	to		49.30		74,572,321	0.81	0.95	to	2.60	23.88	to	25.94
2020	1,995,917		22.50	to		39.15		71,531,066	0.91	0.95	to	2.60	11.57	to	13.43
2019	2,322,666		20.17	to		34.51		73,362,599	0.94	0.95	to	2.60	28.71	to	30.85
MML Sustainable Equity Sub-Account (Service Class) ⁴															
2023	2,038,182		22.64	to		24.78		50,481,335	0.68	1.00	to	3.10	20.42	to	22.96
2022	2,287,275		18.41	to		20.58		46,573,782	0.69	1.00	to	3.10	(19.72)	to	(18.02)
2021	2,420,106		22.46	to		25.64		60,960,010	0.66	1.00	to	3.10	22.91	to	25.52
2020	2,420,663		17.89	to		20.86		49,795,171	0.72	1.00	to	3.10	10.75	to	13.10
2019	2,471,418		15.82	to		18.83		45,996,901	0.76	1.00	to	3.10	27.79	to	30.51
MML Total Return Bond Sub-Account															
2023	3,711,823		8.17	to		10.50		36,326,170	0.02	0.95	to	3.10	0.02	to	0.04
2022	3,801,490		8.01	to		10.07		35,974,681	0.01	0.95	to	3.10	(0.17)	to	(0.16)
2021	4,187,985		9.71	to		11.95		47,397,082	0.02	0.95	to	3.10	(0.05)	to	(0.02)
2020	4,106,252		10.17	to		12.25		47,980,688	3.09	0.95	to	3.10	5.28	to	7.57
2019	2,936,027		9.66	to		11.39		31,973,807	3.02	0.95	to	3.10	5.34	to	7.63
MML U.S. Government Money Market Sub-Account															
2023	12,230,273		6.92	to		9.63		116,713,676	4.52	0.95	to	3.10	1.45	to	3.65
2022	14,291,056		6.82	to		9.29		131,305,870	1.38	0.95	to	3.10	(1.86)	to	0.26
2021	9,905,255		6.95	to		9.27		90,771,755	-	0.95	to	3.10	(3.05)	to	(0.95)
2020	15,675,879		7.17	to		9.36		143,711,817	0.17	0.95	to	3.10	(2.83)	to	(0.72)
2019	8,074,717		7.37	to		9.42		75,534,222	1.69	0.95	to	3.10	(1.40)	to	0.75
Oppenheimer Global Multi-Alternatives Sub-Account															
2023	-		-	-		-		-	-	-	-	-	-	-	-
2022	-		-	-		-		-	-	-	-	-	-	-	-
2021	-		-	-		-		-	-	-	-	-	-	-	-
2020	-		-	-		-		-	-	-	-	-	-	-	-
2019 ⁶	2		8.54	to		9.51		-	1.11	0.95	to	3.10	2.36	to	3.08
PIMCO CommodityRealReturn® Strategy Sub-Account															
2023	985,786		5.17	to		7.39		6,856,177	16.20	0.95	to	3.10	(10.74)	to	(8.80)
2022	1,187,713		5.79	to		8.10		9,095,267	21.08	0.95	to	3.10	5.36	to	7.64
2021	1,195,842		5.50	to		7.53		8,564,039	4.06	0.95	to	3.10	29.05	to	31.85
2020	1,401,409		4.26	to		5.71		7,627,491	6.33	0.95	to	3.10	(1.86)	to	0.27
2019	1,661,426		4.34	to		5.70		9,033,874	4.33	0.95	to	3.10	7.95	to	10.30
PIMCO Income Sub-Account ⁷															
2023	212,500		-	-		9.95		2,114,179	5.24	0.95	to	3.10	-	-	6.77
2022	89,638		-	-		9.32		835,304	3.28	0.95	to	3.10	-	-	-

8. FINANCIAL HIGHLIGHTS (Continued)

At December 31,					For the Years Ended December 31,											
Unit Value ³					Investment	Expense Ratio ²				Total Return ³						
Units		(Lowest to Highest)			Net Assets	Income Ratio ¹	(Lowest to Highest)			(Lowest to Highest)						
VY® CBRE Global Real Estate Sub-Account ⁴																
2023	542,067	\$	12.65	to	\$	18.08	\$	9,161,323	1.78	%						
2022	599,231		11.61	to		16.25		9,135,382	3.01		0.95	to	3.10	(27.41)	to	(25.83)
2021	660,849		16.00	to		21.91		13,624,068	2.65		0.95	to	3.10	30.05	to	32.87
2020	807,288		12.30	to		16.49		12,571,760	5.83		0.95	to	3.10	(7.94)	to	(5.94)
2019	948,461		13.36	to		17.53		15,751,756	2.58		0.95	to	3.10	20.55	to	23.17

¹The investment income ratios represent the dividends, excluding distributions of capital gains, received by the sub-accounts from the underlying mutual fund, divided by the average net assets. These ratios exclude those expenses, such as mortality and expense charges, that are assessed against contract owner accounts either through reductions in the unit values or the redemption of units. The recognition of investment income by the sub-accounts is affected by the timing of the declaration of dividends by the underlying fund in which the sub-account invests.

²The expense ratios represent the annualized contract expense of the sub-accounts of the Separate Account, consisting primarily of mortality and expense charges, for each period indicated. The ratios include only those expenses that result in a direct reduction of unit values. Charges made directly to contract owner accounts through the redemption of units and expenses of the underlying fund have been excluded.

³The total returns are for the periods indicated, including changes in the value of the underlying fund, and the expenses assessed through the reduction of unit values. These ratios do not include any expenses assessed through the redemption of units. As the total return is presented as a range of minimum to maximum values, based on the product grouping representing the related minimum and maximum expense ratio amounts, some individual contract total returns and unit values are not within the ranges presented.

⁴See Note 2 to the financial statements for the previous name of this Sub-Account.

⁵After the close of business on April 29, 2022, Invesco V.I. Core Plus Bond Fund acquired all the net assets of Invesco V.I. Core Bond Fund pursuant to a plan of reorganization approved by the Board of Trustees of the Invesco V.I. Core Plus Bond Fund on December 1, 2021 and by the shareholders of the Invesco V.I. Core Bond Fund on March 31, 2022. The acquisition was accomplished by a tax-free exchange as of the close of business on April 29, 2022. Shares of Invesco V.I. Core Bond Fund were exchanged for the like class of shares of Invesco V.I. Core Plus Bond Fund, based on the relative net asset value of the two funds which resulted in Invesco V.I. Core Bond Fund receiving 1.15816327 shares of Invesco V.I. Core Plus Bond Fund in exchange of 1 share of Invesco V.I. Core Bond Fund. As a result of the underlying fund merger, the subaccount name changed from Invesco V.I. Core Bond to Invesco V.I. Core Plus Bond. Financial highlights for the years 2018-2021 correspond to the Invesco V.I. Core Bond Sub-Account.

⁶For the period January 1, 2022 to November 4, 2022. Effective November 4, 2022 this Sub-Account liquidated and any contract value in the Sub-Account after the close of the New York Stock Exchange on November 4, 2022 was automatically transferred to the MML U.S. Government Money Market Sub-Account.

⁷This fund/sub-account became available to the Separate Account as an investment option on February 28, 2022, but it is presented from the year when the investment or unit activity has been started.

⁸This fund/sub-account became available to the Separate Account as an investment option on May 1, 2023, but it is presented from the year when the investment or unit activity has been started.

8. Financial Highlights (Continued)

- B. The Separate Account assesses charges associated with the contract. These charges are either assessed as a direct reduction in unit values or through a redemption of units for all contracts contained within the Separate Account. The assessment of charges is based on the actual product and additional benefits or riders purchased.

Mortality and Expense Risk Charge* This charge is assessed through a reduction in unit values.	This charge is equal, on an annual basis, to 0.80% - 1.60% of the daily value of the assets invested in each fund.
Administrative Charge** This charge is assessed through a reduction in unit values.	This charge is equal, on an annual basis, to 0.15% of the daily value of the assets invested in each fund.
Administrative Contract Maintenance Charge*** This charge is assessed through the redemption of units.	\$0 - \$40 per contract, annually.
Contingent Deferred Sales Charge/Surrender Charge This charge is assessed through the redemption of units.	0% - 8%
Payment Protector Charge This charge is assessed through a reduction in unit values.	This charge is equal, on an annual basis, to 0.00% - 0.50% of the daily value of the assets invested in each fund.
Additional Death Benefit Options These charges are annualized and are assessed through either a reduction in unit values or the redemption of units.	
A. Reset Death Benefit****	0.00% - 0.20%
B. Ratchet Death Benefit*****	0.00% - 0.70%
C. 5% roll Up Death Benefit	0.00% - 0.40%
D. Basic Death Benefit with Combination Feature	0.00% - 0.45%
E. Return of Purchase Payment	0.00% - 0.35%

8. **Financial Highlights (Continued)**

Rider Charges	
These charges are annualized and are assessed through either a reduction in unit values or the redemption of units.	
A. Equalizer Benefit	0.00% - 0.50%
B. Nursing Home Waiver	0.00% - 0.05%
C. Earnings Enhancement Benefit	0.00% - 0.30%
D. 10% / 20% Free Withdrawal Amount	0.00% - 0.25%
E. 15% / 30% Free Withdrawal Amount	0.00% - 0.15%
F. Guaranteed Minimum Income Benefit (GMIB)	0.00% - 1.50%
G. Guaranteed Minimum Accumulation Benefit (GMAB)	0.00% - 1.40%
H. Guaranteed Lifetime Withdrawal Benefit (GLWB)	0.00% - 1.60%

* For MM Artistry the charges are 1.03% but right reserved to increase to 1.25%.

** Right reserved to increase to .25%.

*** Right reserved to increase to \$60.

**** For Panorama Passage the charge for the Reset Death Benefit is 0.10% on an annual basis of the daily value of the certificate value allocated to the funds and the fixed accounts, unless the charge exceeds the maximum charge, in which case, the charge is the maximum charge. The maximum charge is 0.20% on an annual basis of the daily value of the certificate value allocated to the funds.

***** The Ratchet Death Benefit is 0.25% for Panorama Passage and 0.15% for Panorama Premier on an annual basis of the daily value of the certificate value allocated to the funds and the fixed accounts, unless that charge exceeds the maximum, in this case the charge is the maximum charge. The maximum charge is 0.35% if age 60 or less at certificate issue, 0.50% if age 61 through age 70 at certificate issue, and 0.70% if age 71 or older at certificate issue, of the certificate value allocated to the funds.

Certain contracts may offer credits which will result in the purchase of units.

9. **SUBSEQUENT EVENTS**

The Separate Account's management has reviewed events occurring through March 7, 2024, the date the financial statements were issued, and no subsequent events occurred requiring accrual or disclosure.

PART C OTHER INFORMATION

Item 27.	Exhibits
Exhibit (a)	<u>Board of Directors of Massachusetts Mutual Life Insurance Company authorizing the establishment of the Separate Account 4 – Incorporated by reference to Post-Effective Amendment No. 12 to Registration Statement File No. 333-202684 filed April 28, 2021</u>
Exhibit (b)	Not Applicable.
Exhibit (c)	<ul style="list-style-type: none"> i. <u>Underwriting and Servicing Agreement dated December 16, 2014 by and between MML Investors Services, LLC and Massachusetts Mutual Life Insurance Company – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021</u> ii. <u>Underwriting and Servicing Agreement (Distribution Servicing Agreement) dated April 1, 2014 between MML Strategic Distributors, LLC and Massachusetts Mutual Life Insurance Company – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021</u> iii. <u>Template for Insurance Product Distribution Agreement (version 4/2021) (MML Strategic Distributors, LLC, Massachusetts Mutual Life Insurance Company and C.M. Life Insurance Company) – Incorporated by reference to Post-Effective Amendment No. 2 to Registration Statement File No. 333-255824 filed April 25, 2023</u>
Exhibit (d)	<ul style="list-style-type: none"> i. <ul style="list-style-type: none"> 1. <u>Form of Individual Annuity Contract – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> 2. <u>Form of Individual Annuity Contract (9/8/2008 Version) – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> ii. <ul style="list-style-type: none"> 1. <u>Form of Contract Schedule – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> 2. <u>Form of Contract Schedule (9/8/2008 Version) – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> iii. <u>Death Benefit Rider with Annual Ratchet Feature – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> iv. <u>Equalizer Benefit Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> v. <u>Fixed Account with Declared Interest Rate Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> vi. <u>Fixed Account for Dollar Cost Averaging Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> vii. <u>Fixed Account with Long Term Guarantee Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> viii. <u>Guaranteed Minimum Accumulation Benefit Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> ix. Form of Guaranteed Minimum Income Benefit Rider and Endorsements <ul style="list-style-type: none"> 1. <u>Guaranteed Minimum Income Benefit Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u> 2. <u>Endorsement Amending the Guaranteed Minimum Income Benefit Rider – Incorporated by reference to Pre-Effective Amendment No. 32 to Registration Statement File No. 333-112626 filed July 22, 2020</u>

	3.	<u>Endorsement Amending the Guaranteed Minimum Income Benefit Rider (CA) – Incorporated by reference to Pre-Effective Amendment No. 32 to Registration Statement File No. 333-112626 filed July 22, 2020</u>
	4.	<u>Endorsement Amending the Guaranteed Minimum Income Benefit Rider (FL) – Incorporated by reference to Pre-Effective Amendment No. 32 to Registration Statement File No. 333-112626 filed July 22, 2020</u>
	5.	<u>Endorsement Amending the Guaranteed Minimum Income Benefit Rider (TX) – Incorporated by reference to Pre-Effective Amendment No. 32 to Registration Statement File No. 333-112626 filed July 22, 2020</u>
	6.	<u>Endorsement Amending the Guaranteed Minimum Income Benefit Rider (VA) – Incorporated by reference to Pre-Effective Amendment No. 32 to Registration Statement File No. 333-112626 filed July 22, 2020</u>
	7.	<u>GMIB Exchange Right & Notice of GMIB Rider Charge Increase – Incorporated by reference to Pre-Effective Amendment No. 32 to Registration Statement File No. 333-112626 filed July 22, 2020</u>
	8.	<u>GMIB Exchange Right & Notice of GMIB Rider Charge Increase (IL) – Incorporated by reference to Pre-Effective Amendment No. 32 to Registration Statement File No. 333-112626 filed July 22, 2020</u>
	9.	<u>GMIB Rider Exchange Acceptance Form (IL) – Incorporated by reference to Pre-Effective Amendment No. 32 to Registration Statement File No. 333-112626 filed July 22, 2020</u>
	10.	<u>GMIB Rider Exchange Acceptance Form – Incorporated by reference to Pre-Effective Amendment No. 32 to Registration Statement File No. 333-112626 filed July 22, 2020</u>
	x.	<u>Guaranteed Minimum Withdrawal Benefit Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u>
	xi.	<u>IRA Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u>
	xii.	<u>Lifetime Income Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u>
	xiii.	<u>Nursing Home Benefit Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u>
	xiv.	<u>Qualified Plan Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u>
	xv.	<u>Roth IRA Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u>
	xvi.	<u>SIMPLE IRA Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u>
	xvii.	<u>Unisex Annuity Rates Rider – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u>
Exhibit (e)	i.	<u>Form of Individual Annuity Application – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022</u>
Exhibit (f)	i.	<u>Copy of Charter documentation as amended through August 10, 2008 of Massachusetts Mutual Life Insurance Company – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021</u>
	ii.	<u>By-Laws of Massachusetts Mutual Life Insurance Company as adopted April 8, 2015 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021</u>
Exhibit (g)		Not Applicable.
Exhibit (h)	i.	Fund Participation Agreements
	a.	AIM Funds (Invesco Funds)
	1.	<u>Participation Agreement dated April 30, 2004 with revised Schedule A as of July 6, 2005 (AIM Variable Insurance Funds, AIM Distributors, Inc., and Massachusetts Mutual Life Insurance Company) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021</u>
	ii.	<u>Amendment No. 1 effective as of July 1, 2008 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021</u>
	iii.	<u>Amendment No. 2 effective April 30, 2010 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021</u>
	iii.	<u>Amendment No. 3 effective May 1, 2011 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021</u>

- iv. [Amendment dated May 3, 2021 regarding Rules 30e-3 and 498A – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
- 2. [Financial Support Agreement dated October 1, 2016 \(Invesco Distributors, Inc. and Massachusetts Mutual Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 9 to Registration Statement File No. 333-150916 filed April 26, 2017](#)
- i. [Amendment No. 1 dated May 24, 2019 – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
- ii. [Amendment No. 2 effective April 1, 2022 – Incorporated by reference to Post-Effective Amendment No. 2 to Registration Statement File No. 333-255824 filed April 25, 2023](#)
- 3. [Administrative Services Agreement dated October 1, 2016 \(Invesco Advisers, Inc. and Massachusetts Mutual Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
- b. Fidelity® Funds
- 1. [Amended and Restated Participation Agreement dated May 22, 2017 \(Fidelity®-Variable Insurance Products Fund, Fidelity®-Variable Insurance Products Fund II, Fidelity®-Variable Insurance Products Fund III, Fidelity®-Variable Insurance Products Fund IV, Fidelity®-Variable Insurance Products Fund V, Fidelity Distributors Corporation and Massachusetts Mutual Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 4 to Registration Statement File No. 333-202684 filed April 24, 2018](#)
- i. [First Amendment dated May 22, 2017 – Incorporated by reference to Post-Effective Amendment No. 4 to Registration Statement File No. 333-202684 filed April 24, 2018](#)
- ii. [Amendment dated January 21, 2019 – Incorporated by reference to Post-Effective Amendment No. 5 to Registration Statement File No. 333-202684 filed April 25, 2019](#)
- iii. [Amendment dated October 1, 2020 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
- iv. [Amendment dated March 1, 2021 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
- v. [Amendment dated October 18, 2023 – Incorporated by reference to Post-Effective Amendment No. 7 to Registration Statement File No. 333-255824 filed on or about April 25, 2024](#)
- 2. [Summary Prospectus Agreement effective May 1, 2011 \(Fidelity Distributors Corporation and Massachusetts Mutual Life Insurance Company, C.M. Life Insurance Company, and MML Bay State Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
- 3. [Service Contract dated January 1, 2004 \(MML Investors Services, LLC, MML Strategic Distributors, LLC, and MML Distributors, LLC and Massachusetts Mutual Life Insurance Company\) – Incorporated by reference to Pre-Effective Amendment No. 2 to Registration Statement File No. 333-215823 filed June 14, 2017](#)
- i. [First Amendment dated October 1, 2008 – Incorporated by reference to Pre-Effective Amendment No. 2 to Registration Statement File No. 333-215823 filed June 14, 2017](#)
- ii. [Second Amendment dated May 22, 2017 – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
- iii. [Third Amendment dated November 1, 2018 – Incorporated by reference to Initial Registration Statement to Registration Statement File No. 333-259818 filed September 27, 2021](#)
- iv. [Fourth Amendment dated September 28, 2021 \(C.M. Life Insurance Company becomes a party to the Agreement\) – Incorporated by reference to Registration Statement File No. 333-206438 filed November 15, 2021](#)
- 4. [Service Agreement dated October 1, 1999 – Incorporated by reference to Pre-Effective Amendment No. 2 to Registration Statement File No. 333-215823 filed June 14, 2017](#)
- i. [Amendment dated May 22, 2017 – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
- ii. [Second Amendment dated December 13, 2017 – Incorporated by reference to Post-Effective Amendment No. 10 to Registration Statement File No. 333-150916 filed April 24, 2018](#)
- iii. [Third Amendment dated January 1, 2021 – Incorporated by reference to Post-Effective Amendment No. 12 to Registration Statement File No. 333-202684 filed April 28, 2021](#)

c. Ivy Funds

1. [Participation Agreement dated as of October 25, 2012 \(Waddell & Reed, Inc., Ivy Funds Variable Insurance Portfolios and Massachusetts Mutual Life Insurance Company and C.M. Life Insurance Company\) – Incorporated by reference to Pre-Effective Amendment No. 1 to Registration Statement File No. 333-255824 filed August 24, 2021](#)
 - i. [First Amendment dated January 18, 2013 – Incorporated by reference to Pre-Effective Amendment No. 1 to Registration Statement File No. 333-255824 filed August 24, 2021](#)
 - ii. [Second Amendment dated June 12, 2015 – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
 - iii. [Third Amendment dated February 18, 2016 – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
 - iv. [Fourth Amendment dated October 1, 2016 – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
 - v. [Fifth Amendment dated March 1, 2017 – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
 - vi. [Sixth Amendment dated May 1, 2021 regarding Rules 30e-3 and 498a – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022](#)
 - vii. [Seventh Amendment dated October 20, 2021 \(C.M. Life Insurance Company becomes a party to the Agreement\) – Incorporated by reference to Post-Effective Amendment No. 34 to Registration Statement File No. 333-112626 filed January 27, 2022](#)
2. [Services Agreement dated October 25, 2012 by and among Waddell & Reed, Inc., Massachusetts Mutual Life Insurance Company and MML Distributors, LLC – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
 - i. [Amendment No. 1 effective April 1, 2014 – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
 - ii. [Amendment No. 2 effective April 15, 2015 – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
 - iii. [Amendment No. 3 dated October 1, 2016 – Incorporated by reference to Post-Effective Amendment No. 11 to Registration Statement File No. 333-206438 filed November 15, 2021](#)
 - iv. [Amendment No. 4 dated October 20, 2021 \(C.M. Life Insurance Company becomes a party to the Agreement\) – Incorporated by reference to Post-Effective Amendment No. 35 to Registration Statement File No. 333-112626 filed January 27, 2022](#)

d. MML Funds

1. [Participation Agreement dated August 15, 2008 \(MML Series Investment Fund, American Funds Insurance Series, Capital Research and Management Company, and Massachusetts Mutual Life Insurance Company\) – Incorporated by reference to Initial Registration Statement File No. 333-259818 filed September 27, 2021](#)
 2. [Participation Agreement dated November 17, 2005 \(MML Series Investment Fund, Massachusetts Mutual Life Insurance Company and MML Bay State Life Insurance Company and C.M. Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - i. [First Amendment effective November 17, 2005 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - ii. [Second Amendment dated as of August 26, 2008 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - iii. [Third Amendment dated April 9, 2010 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - iv. [Fourth Amendment dated and effective July 23, 2010 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
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- v. [Fifth Amendment dated August 28, 2012 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
- vi. [Sixth Amendment dated April 1, 2014 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
- vii. [Seventh Amendment dated August 11, 2015 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
- viii. [Eighth Amendment dated February 20, 2020 – Incorporated by reference to Post-Effective Amendment No. 7 to Registration Statement File No. 333-202684 filed April 28, 2020](#)
- ix. [Ninth Amendment dated June 2, 2021 regarding Rules 30e-3 and 498A – Incorporated by reference to Pre-Effective Amendment No. 1 to Registration Statement File No. 333-255824 filed August 24, 2021](#)

e. MML II Funds

- 1. [Participation Agreement dated November 17, 2005 \(MML Series Investment Fund II, Massachusetts Mutual Life Insurance Company and MML Bay State Life Insurance Company and C.M. Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - i. [First Amendment effective November 17, 2005 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - ii. [Second Amendment dated as of August 26, 2008 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - iii. [Third Amendment dated as of April 9, 2010 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - iv. [Fourth Amendment dated and effective July 23, 2010 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - v. [Fifth Amendment dated August 1, 2011 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - vi. [Sixth Amendment dated and effective August 28, 2012 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - vii. [Seventh Amendment dated and effective November 12, 2012 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - viii. [Eighth Amendment dated April 1, 2014 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - ix. [Ninth Amendment dated August 11, 2015 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - x. [Tenth Amendment dated February 20, 2020 – Incorporated by reference to Post-Effective Amendment No. 7 to Registration Statement File No. 333-202684 filed April 28, 2020](#)
 - xi. [Eleventh Amendment dated June 2, 2021 regarding Rules 30e-3 and 498A – Incorporated by reference to Pre-Effective Amendment No. 1 to Registration Statement File No. 333-255824 filed August 24, 2021](#)

f. PIMCO Funds

- 1. [Participation Agreement dated as of April 21, 2006 \(Massachusetts Mutual Life Insurance Company, C.M. Life Insurance Company and PIMCO Variable Insurance Trust and Allianz Global Investors Distributors LLC\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - i. [Amendment No. 1 effective as of June 30, 2008 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - ii. [New Agreements and Amendments dated November 10, 2010 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)
 - iii. [Amendment effective as of May 1, 2011 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- iv. [Amendment signed March 1, 2017 – Incorporated by reference to Post-Effective Amendment No. 18 to Registration Statement File No. 333-95845 filed April 26, 2017](#)

- 2. [Termination Agreement dated November 10, 2010 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- 3. [Selling Agreement executed on April 26, 2006 \(Allianz Global Investors Distributors LLC, Massachusetts Mutual Life Insurance Company and C.M. Life Insurance Company\) for Advisor Class Shares of PIMCO Variable Insurance Trust – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- 4. [Services Agreement \(Trust\) for PIMCO Variable Insurance Trust \(Pacific Investment Management Company LLC, Massachusetts Mutual Life Insurance Company and C.M. Life Insurance Company\) effective as of March 1, 2017 – Incorporated by reference to Pre-Effective Amendment No. 2 to Registration Statement File No. 333-215823 filed June 14, 2017](#)

- i. [Amendment No. 1 dated November 1, 2020 – Incorporated by reference to Post-Effective Amendment No. 18 to Registration Statement File No. 333-150916 filed April 28, 2021](#)

g. Voya Funds

- 1. [Participation Agreement dated April 26, 2006 \(Massachusetts Mutual Life Insurance Company, ING Funds Distributor, LLC and ING Variable Products Trust\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- i. [Amendment dated May 28, 2007 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- ii. [Amendment dated April 3, 2008 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- iii. [Amendment dated September 6, 2008 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- iv. [Amendment dated May 27, 2010 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- v. [Amendment dated January 17, 2014 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- vi. [Amendment dated December 23, 2014 – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- vii. [Amendment dated June 29, 2016 – Incorporated by reference to Post-Effective Amendment No. 26 to Registration Statement File No. 333-112626 filed April 26, 2017](#)

ii. Rule 22c-2 Agreements (Shareholder Information Agreements)

- a. [AIM Investment Services, Inc. effective October 16, 2007 \(Massachusetts Mutual Life Insurance Company, and C.M. Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- 1. [Amendment No. 1 dated June 30, 2020 – Incorporated by reference to Pre-Effective Amendment 3 to Registration Statement File No. 333-229670 filed October 2, 2020](#)

- b. [Fidelity Distributors Corporation effective October 16, 2007 \(Massachusetts Mutual Life Insurance Company, MML Bay State Life Insurance Company, and C.M. Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- c. [Ivy Funds Variable Insurance Portfolios Amended and Restated Agreement dated November 13, 2012 \(Massachusetts Mutual Life Insurance Company\) – Incorporated by reference to Initial Registration Statement File No. 333-259818 filed September 27, 2021](#)

- d. [MML Series Investment Fund effective October 16, 2007 \(Massachusetts Mutual Life Insurance Company, MML Bay State Life Insurance Company, and C.M. Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- e. [MML Series Investment Fund II effective October 16, 2007 \(Massachusetts Mutual Life Insurance Company, MML Bay State Life Insurance Company, and C.M. Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- f. [PIMCO Variable Insurance Trust effective October 16, 2007 \(Massachusetts Mutual Life Insurance Company, and C.M. Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

- g. [Voya Variable Products Trust effective October 16, 2007 \(Massachusetts Mutual Life Insurance Company, and C.M. Life Insurance Company\) – Incorporated by reference to Post-Effective Amendment No. 28 to Registration Statement File No. 333-45039 filed June 25, 2021](#)

Exhibit (i) Not Applicable.

Exhibit (j) Not Applicable.

Exhibit (k) [Opinion and Consent of Counsel as to the legality of the securities being registered – Incorporated by reference to Post-Effective Amendment No. 37 to Registration Statement File No. 333-112626 filed April 28, 2022](#)

Exhibit (l)	i. Auditor Consents:
	<ul style="list-style-type: none"> • Company Financial Statements^(*) • Separate Account Financial Statements^(*)
	ii. a. Powers of Attorney for:
	<ul style="list-style-type: none"> • Roger W. Crandall • Mark T. Bertolini • Kathleen A. Corbet • James H. DeGraffenreidt, Jr. • Isabel D. Goren • Bernard A. Harris, Jr. • Michelle K. Lee • Jeffrey H. Leiden • Laura J. Sen • William T. Spitz • H. Todd Stitzer • Elizabeth A. Ward
	– Incorporated by reference to Post-Effective Amendment No. 7 to Registration Statement File No. 333-229670 filed September 1, 2023
	b. Power of Attorney for Keith McDonagh
	– Incorporated by reference to Post-Effective Amendment No. 7 to Registration Statement File No. 333-255824 filed on or about April 25, 2024
	iii. Resolution Regarding the Rules and Regulations of the Board of Directors dated February 13, 2019 – Incorporated by reference to Pre-Effective Amendment No. 3 to Registration Statement File No. 333-229670 filed October 2, 2020
Exhibit (m)	Not Applicable.
Exhibit (n)	Not Applicable.

(*) Filed herewith

Item 28. Directors and Officers of the Depositor**Directors of Massachusetts Mutual Life Insurance Company**

*Roger W. Crandall, Director,
Chairman*
1295 State Street
Springfield, MA 01111

Mark T. Bertolini, Director
PO Box 20917
700 Columbus Avenue
New York, NY 10025

Jeffrey M. Leiden, Director
15 North Beach Road
Hobe Sound, FL 33455

H. Todd Stitzer, Lead Director
1312 Casey Key Road
Nokomis, FL 34275

Kathleen A. Corbet, Director
49 Cros Ridge Road
New Canaan, CT 06840

James H. DeGraffenreidt, Jr., Director
1340 Smith Avenue, Suite 200
Baltimore, MD 21209

Laura J. Sen, Director
95 Pembroke Street, Unit 1
Boston, MA 02118

Bernard A. Harris, Jr., Director
3333 Allen Parkway, #1709
Houston, Texas 77019

Isabella D. Goren, Director
8030 Acoma Lane
Dallas, TX 75252

William T. Spitz, Director
16 Wynstone
Nashville, TN 37215

Michelle K. Lee, Director
19952 Moran Lane
Saratoga, CA 95070

Principal Officers of Massachusetts Mutual Life Insurance Company

Roger W. Crandall, President and Chief Executive Officer
1295 State Street
Springfield, MA 01111

Julietta Sinisgalli, Treasurer
1295 State Street
Springfield, MA 01111

Michael J. O'Connor, General Counsel
1295 State Street
Springfield, MA 01111

Elizabeth A. Ward, Chief Financial Officer
1295 State Street
Springfield, MA 01111

Dominic Blue, Head of Third-Party Distribution and New Markets
1295 State Street
Springfield, MA 01111

Paul LaPiana, Head of Brand, Product and Affiliated Distribution
1295 State Street
Springfield, MA 01111

Keith McDonagh, Corporate Controller
10 Fan Pier Boulevard
Boston, MA 02210

Eric Partlan, Chief Investment Officer
1295 State Street
Springfield, MA 01111

John Rugel, Head of Operations
1295 State Street
Springfield, MA 01111

Susan Cicco, Head of Human Resources & Employee Experience
1295 State Street
Springfield, MA 01111

Sears Merritt, Head of Technology & Experience
1295 State Street
Springfield, MA 01111

Geoffrey Craddock, Chief Risk Officer
10 Fan Pier Boulevard
Boston, MA 02210

Akintokunbo Akinbajo, Corporate Secretary
1295 State Street
Springfield, MA 01111

Item 29. Persons Controlled by or Under Common Control with the Depositor or the Registrant

– Incorporated by reference to Item 32 on Form N-6 in Post-Effective Amendment No. 3 to Registration Statement File No. 333-259818 filed on or about April 25, 2024

Item 30. Indemnification

MassMutual directors and officers are indemnified under Article V. of the by-laws of Massachusetts Mutual Life Insurance Company, as set forth below.

ARTICLE V. of the By-laws of MassMutual provides for indemnification of directors and officers as follows:

“ARTICLE V.

INDEMNIFICATION

Subject to limitations of law, the Company shall indemnify:

- (a) each director, officer or employee;
- (b) any individual who serves at the request of the Company as a director, board member, committee member, partner, trustee, officer or employee of any foreign or domestic organization or any separate investment account; or
- (c) any individual who serves in any capacity with respect to any employee benefit plan,

from and against all loss, liability and expense imposed upon or incurred by such person in connection with any threatened, pending or completed action, claim, suit, investigation or proceeding of any nature whatsoever, in which such person may be involved or with which he or she may be threatened to be involved, by reason of any alleged act, omission or otherwise while serving in any such capacity, whether such action, claim, suit, investigation or proceeding is civil, criminal, administrative, arbitrative, or investigative and/or formal or informal in nature. Indemnification shall be provided although the person no longer serves in such capacity and shall include protection for the person's heirs and legal representatives.

Indemnities hereunder shall include, but not be limited to, all costs and reasonable counsel fees, fines, penalties, judgments or awards of any kind, and the amount of reasonable settlements, whether or not payable to the Company or to any of the other entities described in the preceding paragraph, or to the policyholders or security holders thereof.

Notwithstanding the foregoing, no indemnification shall be provided with respect to:

- (1) any matter as to which the person shall have been adjudicated in any proceeding not to have acted in good faith in the reasonable belief that his or her action was in the best interests of the Company or, to the extent that such matter relates to service with respect to any employee benefit plan, in the best interests of the participants or beneficiaries of such employee benefit plan;
- (2) any liability to any entity which is registered as an investment company under the Federal Investment Company Act of 1940 or to the security holders thereof, where the basis for such liability is willful misfeasance, bad faith, gross negligence or reckless disregard of the duties involved in the conduct of office; and
- (3) any action, claim or proceeding voluntarily initiated by any person seeking indemnification, unless such action, claim or proceeding had been authorized by the Board of Directors or unless such person's indemnification is awarded by vote of the Board of Directors.

In any matter disposed of by settlement or in the event of an adjudication which in the opinion of the General Counsel or his or her delegate does not make a sufficient determination of conduct which could preclude or permit indemnification in accordance with the preceding paragraphs (1), (2) and (3), the person shall be entitled to indemnification unless, as determined by the majority of the disinterested directors or in the opinion of counsel (who may be an officer of the Company or outside counsel employed by the Company), such person's conduct was such as precludes indemnification under any such paragraph. The termination of any action, claim, suit, investigation or proceeding by judgment, order, settlement, conviction, or upon a plea of nolo contendere or its equivalent shall not, of itself, create a presumption that the person did not act in good faith and in a manner which he or she reasonably believed to be in the best interests of the Company.

The Company may at its option indemnify for expenses incurred in connection with any action or proceeding in advance of its final disposition, upon receipt of a satisfactory undertaking for repayment if it be subsequently determined that the person thus indemnified is not entitled to indemnification under this Article V.”

To provide certainty and more clarification regarding the indemnification provisions of the Bylaws set forth above, MassMutual has entered into indemnification agreements with each of its directors, and with each of its officers who serve as a director of a subsidiary of MassMutual, (a "Director"). Pursuant to the Agreements, MassMutual agrees to indemnify a Director, to the extent legally permissible, against (a) all expenses, judgments, fines and settlements ("Costs"), liabilities, and penalties paid in connection with a proceeding involving the Director because he or she is a director if the Director (i) acted in good faith, (ii) reasonably believed the conduct was in the Company's best interests; (iii) had no reasonable cause to believe the conduct was unlawful (in a criminal proceeding); and, (iv) engaged in conduct for which the Director shall not be liable under MassMutual's Charter or By-Laws. MassMutual further agrees to indemnify a Director, to the extent permitted by law, against all Costs paid in connection with any proceeding (i) unless the Director breached a duty of loyalty, (ii) except for liability for acts or omissions not in good faith, involving intentional misconduct or a knowing violation of law, (iii) except for liability under Section 6.40 of Chapter 156D of Massachusetts Business Corporation Act ("MBCA"), or (iv) except for liability related to any transaction from which the Director derived an improper benefit. MassMutual will also indemnify a Director, to the fullest extent authorized by the MBCA, against all expenses to the extent the Director has been successful on the merits or in defense of any proceeding. If any court determines that despite an adjudication of liability to MassMutual or its subsidiary that the Director is entitled to indemnification, MassMutual will indemnify the Director to the extent permitted by law. Subject to the Director's obligation to pay MassMutual in the event that the Director is not entitled to indemnification, MassMutual will pay the expenses of the Director prior to a final determination as to whether the Director is entitled to indemnification.

Item 31. Principal Underwriters

- (a) MML Investors Services, LLC ("MMLIS") acts as principal underwriter of the contracts/policies/certificates sold by its registered representatives and MML Strategic Distributors, LLC ("MSD") serves as principal underwriter of the contracts/policies/certificates sold by registered representatives of other broker-dealers who have entered into distribution agreements with MSD.

MMLIS and MSD either jointly or individually act as principal underwriters for:

Massachusetts Mutual Variable Life Separate Account I, Massachusetts Mutual Variable Annuity Separate Account 1, Massachusetts Mutual Variable Annuity Separate Account 2, Massachusetts Mutual Variable Annuity Separate Account 3, Massachusetts Mutual Variable Annuity Separate Account 4, Panorama Separate Account, Connecticut Mutual Variable Life Separate Account I, MML Bay State Variable Life Separate Account I, MML Bay State Variable Annuity Separate Account 1, Panorama Plus Separate Account, C.M. Multi-Account A, C.M. Life Variable Life Separate Account I, Massachusetts Mutual Variable Life Separate Account II.

(b) MMLIS and MSD are the principal underwriters for this Contract. The following people are officers and directors of MMLIS and officers and directors of MSD:

DIRECTORS AND OFFICERS OF MML INVESTORS SERVICES, LLC

Name	Positions and Offices	Principal Business Address
John Vaccaro	Director, Chief Executive Officer, Chairman of the Board, and Agency Field Force Supervisor	(*)
Vaughn Bowman	Director and President	(*)
Geoffrey Craddock	Director	10 Fan Pier Boulevard Boston, MA 02210
Paul LaPiana	Director	(*)
Jennifer Reilly	Director	10 Fan Pier Boulevard Boston, MA 02210
David Mink	Vice President and Chief Operations Officer	11215 North Community House Rd. Charlotte, NC 28277
Frank Rispoli	Chief Financial Officer and Treasurer	(*)
Edward K. Duch, III	Chief Legal Officer, Vice President, and Secretary	(*)
Courtney Reid	Chief Compliance Officer	(*)
James P. Puhala	Deputy Chief Compliance Officer	(*)
Michael Gilliland	Deputy Chief Compliance Officer	(*)
Thomas Bauer	Chief Technology Officer	(*)
Anthony Frogameni	Chief Privacy Officer	(*)
Linda Bestepe	Vice President	(*)
Daken Vanderburg	Vice President	(*)
Brian Foley	Vice President	(*)
James Langham	Vice President	(*)
Mary B. Wilkinson	Vice President	11215 North Community House Rd. Charlotte, NC 28277
David Holtzer	Field Risk Officer	11215 North Community House Rd. Charlotte, NC 28277
Amy Francella	Assistant Secretary	(*)
Alyssa O'Connor	Assistant Secretary	(*)
Pablo Cabrera	Assistant Treasurer	(*)
Jeffrey Sajdak	Assistant Treasurer	(*)
Julieta Sinisgalli	Assistant Treasurer	(*)
Kevin Lacombe	Assistant Treasurer	(*)
Tricia Cohen	Continuing Education Officer	(*)
Mario Morton	Registration Manager	(*)
Kelly Pirrotta	AML Compliance Officer	(*)
John Rogan	Regional Vice President	(*)
Michelle Pedigo	Regional Vice President	(*)

(*) 1295 State Street, Springfield, MA 01111-0001

OFFICERS AND DIRECTORS OF MML STRATEGIC DISTRIBUTORS, LLC

Name	Positions and Offices	Principal Business Address
Dominic Blue	Director and Chairman of the Board	(*)
Matthew DiGangi	Director and Chief Executive Officer and President	(*)
Geoffrey Craddock	Director	10 Fan Pier Boulevard Boston, MA 02210
Jennifer Reilly	Director	10 Fan Pier Boulevard Boston, MA 02210
Frank Rispoli	Chief Financial Officer and Treasurer	(*)
Edward K. Duch, III	Chief Legal Officer, Vice President, and Secretary	(*)
James P. Puhala	Vice President and Chief Compliance Officer	(*)
Vincent Baggetta	Chief Risk Officer	(*)
Paul LaPiana	Vice President	(*)
Lisa Todd	Vice President	(*)
Delphine Soucie	Vice President	(*)
Alyssa O'Connor	Assistant Secretary	(*)
Pablo Cabrera	Assistant Treasurer	(*)
Jeffrey Sajdak	Assistant Treasurer	(*)
Julieta Sinisgalli	Assistant Treasurer	(*)
Mario Morton	Registration Manager	(*)
Kelly Pirrotta	AML Compliance Officer	(*)

(*) 1295 State Street, Springfield, MA 01111-0001

(c) Compensation From the Registrant

For information about all commissions and other compensation received by each principal underwriter, directly or indirectly, from the Registrant during the Registrant's last fiscal year, refer to the "Distribution" section of the Statement of Additional Information.

Item 32. Location of Accounts and Records

All accounts, books, or other documents required to be maintained by Section 31(a) of the Investment Company Act of 1940 and the rules promulgated thereunder are maintained by the Registrant through Massachusetts Mutual Life Insurance Company, 1295 State Street, Springfield, Massachusetts 01111-0001.

Item 33. Management Services

Not Applicable

Item 34. Fee Representation

REPRESENTATION UNDER SECTION 26(f)(2)(A) OF THE INVESTMENT COMPANY ACT OF 1940

Massachusetts Mutual Life Insurance Company hereby represents that the fees and charges deducted under the MassMutual Transitions SelectSM (Transitions Select) contract described in this Registration Statement, in the aggregate, are reasonable in relation to the services rendered, the expenses expected to be incurred, and the risks assumed by Massachusetts Mutual Life Insurance Company.

SIGNATURES

Pursuant to the requirements of Securities Act of 1933 and the Investment Company Act of 1940, the Registrant certifies that it meets all of the requirements for effectiveness of this registration statement under Rule 485(b) under the Securities Act and has duly caused this registration statement to be signed on its behalf by the undersigned, duly authorized, in the City of Wilmington, and the State of North Carolina on this 24th day of April, 2024.

MASSACHUSETTS MUTUAL VARIABLE ANNUITY SEPARATE ACCOUNT 4
(Registrant)

MASSACHUSETTS MUTUAL LIFE INSURANCE COMPANY
(Depositor)

By	<u>ROGER W. CRANDALL*</u> Roger W. Crandall President and Chief Executive Officer (principal executive officer) Massachusetts Mutual Life Insurance Company
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Pursuant to the requirements of the Securities Act of 1933, this registration statement has been signed by the following persons in the capacities and on the dates indicated.

Signature*	Title	Date
<u>ROGER W. CRANDALL *</u> Roger W. Crandall	Director and Chief Executive Officer (principal executive officer)	April 24, 2024
<u>ELIZABETH A. WARD *</u> Elizabeth A. Ward	Chief Financial Officer (principal financial officer)	April 24, 2024
<u>KEITH MCDONAGH *</u> Keith McDonagh	Corporate Controller (principal accounting officer)	April 24, 2024
<u>MARK T. BERTOLINI *</u> Mark T. Bertolini	Director	April 24, 2024
<u>KATHLEEN A. CORBET *</u> Kathleen A. Corbet	Director	April 24, 2024
<u>JAMES H. DEGRAFFENREIDT, JR. *</u> James H. DeGraffenreidt, Jr.	Director	April 24, 2024
<u>ISABELLA D. GOREN *</u> Isabella D. Goren	Director	April 24, 2024
<u>BERNARD A. HARRIS, JR. *</u> Bernard A. Harris, Jr.	Director	April 24, 2024
<u>MICHELLE K. LEE *</u> Michelle K. Lee	Director	April 24, 2024
<u>JEFFREY M. LEIDEN *</u> Jeffrey M. Leiden	Director	April 24, 2024
<u>LAURA J. SEN *</u> Laura J. Sen	Director	April 24, 2024
<u>WILLIAM T. SPITZ *</u> William T. Spitz	Director	April 24, 2024
<u>H. TODD STITZER *</u> H. Todd Stitzer	Director	April 24, 2024
<u>/s/ GARY F. MURTAGH</u> * Gary F. Murtagh Attorney-in-Fact pursuant to Powers of Attorney		

INDEX TO EXHIBITS

Item No.	Exhibit
Item 27.	Exhibit (l) i. Auditor Consents <ul style="list-style-type: none">• Company Financial Statements• Separate Account Financial Statements

[KPMG letterhead appears here]

Consent of Independent Registered Public Accounting Firm

We consent to the use of our report dated February 27, 2024, with respect to the statutory financial statements of Massachusetts Mutual Life Insurance Company, included herein, and to the reference to our firm under the heading “Experts” in the Statement of Additional Information.

/s/ KPMG LLP

Hartford, Connecticut
April 22, 2024

[KPMG letterhead appears here]

Consent of Independent Registered Public Accounting Firm

We consent to the use of our report dated March 7, 2024, with respect to the financial statements of Massachusetts Mutual Variable Annuity Separate Account 4, included herein, and to the reference to our firm under the heading “Experts” in the Statement of Additional Information.

/s/ KPMG LLP

Boston, Massachusetts

April 22, 2024
