

**Pricing Supplement to Short Form Base Shelf Prospectus dated March 25, 2022,  
the Prospectus Supplement thereto dated March 28, 2022, as supplemented November 11, 2022 and  
the Prospectus Supplement thereto dated March 28, 2022, as supplemented November 11, 2022**

*No securities regulatory authority has expressed an opinion about these securities and it is an offence to claim otherwise.*

*This pricing supplement together with the short form base shelf prospectus dated March 25, 2022, the prospectus supplement dated March 28, 2022 and the prospectus supplement dated March 28, 2022, to which it relates, as amended or supplemented, and each document incorporated by reference into such prospectus, constitutes a public offering of these securities only in those jurisdictions where they may be lawfully offered for sale and therein only by persons permitted to sell such securities.*

*The securities to be issued hereunder have not been, and will not be, registered under the United States Securities Act of 1933, as amended and, subject to certain exceptions, may not be offered, sold or delivered, directly or indirectly, in the United States of America or for the account or benefit of U.S. persons.*



**Royal Bank of Canada  
Senior Note Program  
Index Linked Securities  
Maximum US\$20,000,000 (200,000 Securities)  
RBC LiONS™ S&P 500 Linked Fixed 8.65% Securities (USD), Series 21,  
F-Class  
Due January 31, 2024  
Non-Principal Protected Securities**

**January 5, 2023**

Royal Bank of Canada (the “**Bank**”) is offering up to US\$20,000,000 of RBC LiONS™ S&P 500 Linked Fixed 8.65% Securities (USD), Series 21, F-Class (which we refer to as the “**Securities**” for the purpose of this pricing supplement only and not for the purpose of the “base shelf prospectus” as defined below), designed for investors who are prepared and can afford to take the risk that they will lose substantially all of the Principal Amount (defined herein) of their investment because they believe that the Closing Level (defined herein) of the S&P 500® Index (the “**Index**”) will be greater than or equal to the Protection Barrier Level (defined herein) on the Final Valuation Date (defined herein). Payment at maturity will be based on the price performance of the Index. Holders of the Securities will also receive Interest Payments (defined herein) payable monthly on each Interest Payment Date (defined herein), each at a fixed amount of US\$0.7208 per Security. Such Interest Payments are not contingent on or related to the price performance of the Index. The return on the Securities is capped; even if the Final Index Level (defined herein) is greater than or equal to the Protection Barrier Level, the maximum return on the Securities would be equal to US\$8.65 per Security.

The initial estimated value of the Securities as of December 30, 2022 was US\$98.01 per Security, which is less than the price to the public and is not an indication of the actual profit to the Bank or its affiliates. The actual value of the Securities at any time will reflect many factors, cannot be predicted with accuracy, and may be less than this amount. We describe our determination of the initial estimated value in more detail below. See “Risk Factors” and “Preparation of Initial Estimated Value”.

The Securities are described in this pricing supplement delivered together with our short form base shelf prospectus dated March 25, 2022 (the “**base shelf prospectus**”), the prospectus supplement establishing our Senior Note Program dated March 28, 2022, as supplemented November 11, 2022 (the “**program supplement**”) and a prospectus supplement which generally describes index linked securities that we may offer under our Senior Note Program dated March 28, 2022, as supplemented November 11, 2022 (the “**product supplement**”).

**The Securities are not fixed income securities and are not designed to be alternatives to fixed income or money market instruments. The Securities are structured products that possess downside risk.**

**The Securities will not constitute deposits insured under the *Canada Deposit Insurance Corporation Act*.**

The Bank has determined that the Securities are not subject to withholding tax under Section 871(m) of the U.S. Internal Revenue Code.

**An investment in the Securities involves risks. An investment in the Securities is not the same as a direct investment in the securities that comprise the index to which the Securities are linked and investors have no rights with respect to the securities underlying such index. The Securities are considered to be “specified derivatives” under applicable Canadian securities laws. If you purchase Securities, you will be exposed to changes in the level of the Index and fluctuations in interest rates, among other factors. Index levels are volatile and an investment in the Securities may be considered to be speculative. Since the Securities are not principal protected and the Principal Amount will be at risk, you could lose substantially all of your investment. See “Risk Factors”.**

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Price: US\$100 per Security

Minimum Subscription: US\$5,000 (50 Securities)

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	<b>Price to public</b>	<b>Selling Commissions and Dealer's fee<sup>(1)</sup></b>	<b>Net proceeds to the Bank</b>
Per Security	US\$100.00	US\$0.00	US\$100.00
Total <sup>(2)</sup>	US\$20,000,000	US\$0.00	US\$20,000,000

(1) No sales commission will be paid in connection with this issuance of Securities. An agency fee will be paid, from the Bank's own funds, to Richardson Wealth Limited in an amount up to 0.15% of the Principal Amount of the Securities issued under this offering for acting as independent agent.

(2) Reflects the maximum offering size of the Securities. **There is no minimum amount of funds that must be raised under this offering. This means that the issuer could complete this offering after raising only a small proportion of the offering amount set out above.**

The Securities are offered severally by RBC Dominion Securities Inc. ("RBC DS") and Richardson Wealth Limited (collectively, the "Dealers") as agents under a dealer agreement dated March 28, 2022, as amended or supplemented from time to time. **RBC DS is our wholly owned subsidiary. Consequently, we are a related and connected issuer of RBC DS within the meaning of applicable securities legislation.** See "Dealers" in this pricing supplement and "Plan of Distribution" in the program supplement.

The Securities will not be listed on any stock exchange. Securities may be resold using the Fundserv network at a price determined at the time of sale by the Calculation Agent (defined herein), which price may be lower than the Principal Amount of such Securities. There is no assurance that a secondary market for the Securities will develop or be sustained. See "Secondary Market for Securities", "Description of the Securities–Calculation Agent" and "Risk Factors" in the program supplement and "Secondary Market" in this pricing supplement.

#### **Bank Trademarks**

Lion & Globe symbol and RBC LiONS™ are registered trademarks of Royal Bank of Canada.

## Prospectus for Securities

Securities described in this pricing supplement will be issued under our Senior Note Program and will be unsecured, unsubordinated debt obligations. The Securities are Senior Debt Securities (as defined in the base shelf prospectus referred to below) and are described in four separate documents: (1) the base shelf prospectus, (2) the program supplement, (3) the product supplement, and (4) this pricing supplement, all of which collectively constitute the “prospectus” for the Securities. See “Prospectus for Securities” in the program supplement.

### Documents Incorporated by Reference

This pricing supplement is deemed to be incorporated by reference into the base shelf prospectus solely for the purpose of our Senior Note Program and the Securities issued hereunder. Other documents are also incorporated or deemed to be incorporated by reference into the base shelf prospectus and reference should be made to the base shelf prospectus for full particulars.

### Marketing Materials

The version of the summary for the Securities that was filed with the securities commissions or similar regulatory authorities in each of the provinces and territories of Canada as “marketing materials” (as defined in National Instrument 41-101 – *General Prospectus Requirements*) on January 5, 2023 is deemed to be incorporated by reference into the base shelf prospectus solely for the purpose of our Senior Note Program and the Securities issued hereunder. Any version of marketing materials filed with the securities commission or similar regulatory authority in each of the provinces and territories of Canada in connection with this offering after the date hereof but prior to the termination of the distribution of the Securities under this pricing supplement (including any amendments to, or an amended version of, the marketing materials) is deemed to be incorporated by reference herein and in the base shelf prospectus solely for the purpose of our Senior Note Program and the Securities issued hereunder. Any such marketing materials are not part of this pricing supplement or the base shelf prospectus to the extent that the contents of the marketing materials have been modified or superseded by a statement contained in an amendment to this pricing supplement.

### Caution Regarding Forward-Looking Statements

From time to time, we make written or oral forward-looking statements within the meaning of certain securities laws, including the “safe harbour” provisions of the United States Private Securities Litigation Reform Act of 1995 and any applicable Canadian securities legislation. We may make forward-looking statements in the base shelf prospectus and in the documents incorporated by reference therein, in the program supplement, in the product supplement, in this pricing supplement, in other filings with Canadian regulators or the United States Securities and Exchange Commission, in other reports to shareholders, and in other communications. Forward-looking statements in, or incorporated by reference in, this prospectus include, but are not limited to, statements relating to our financial performance objectives, vision and strategic goals, the Economic, market and regulatory review and outlook section of our management’s discussion and analysis for the year ended October 31, 2022 (the “**2022 Management’s Discussion and Analysis**”) for Canadian, U.S., U.K., European and global economies, the regulatory environment in which we operate, the impact from rising interest rates, the expected closing of the transaction involving HSBC Bank Canada, the Strategic priorities and Outlook sections in the 2022 Management’s Discussion and Analysis for each of our business segments, the risk environment including our credit risk, market risk, liquidity and funding risk, the direction of the coronavirus (COVID-19) pandemic and its potential impact on our business operations, financial results, condition and objectives and on the global economy and financial market conditions, our climate- and sustainability-related beliefs, targets and goals (including our net-zero and sustainable finance commitments), and includes our President and Chief Executive Officer’s statements. The forward-looking information contained in, or incorporated by reference in, this prospectus is presented for the purpose of assisting the holders of our securities and financial analysts in understanding our financial position and results of operations as at and for the periods ended on the dates presented, as well as our financial performance objectives, vision and strategic goals, and may not be appropriate for other purposes. Forward-looking statements are typically identified by words such as “believe”, “expect”, “foresee”, “forecast”, “anticipate”, “intend”, “estimate”, “goal”, “commit”, “target”, “objective”, “plan” and “project” and similar expressions of future or conditional verbs such as “will”, “may”, “might”, “should”, “could” or “would”.

By their very nature, forward-looking statements require us to make assumptions and are subject to inherent risks and uncertainties, which give rise to the possibility that our predictions, forecasts, projections, expectations or conclusions will not prove to be accurate, that our assumptions may not be correct, that our financial performance, environmental & social or other objectives, vision and strategic goals will not be achieved, and that our actual results may differ materially from such predictions, forecasts, projections, expectations or conclusions. We caution readers not to place undue reliance on these statements as a number of risk factors could cause our actual results to differ materially from the expectations expressed in such forward-looking statements. These factors – many of which are beyond our control and the effects of which can be difficult to predict – include: credit, market, liquidity and funding, insurance, operational, regulatory compliance (which could lead to us being subject to various legal and regulatory proceedings, the potential outcome of which could include regulatory restrictions, penalties and fines), strategic, reputation, competitive, model, legal and regulatory environment, systemic risks and other risks discussed in the risk sections of the 2022 Management’s Discussion and Analysis incorporated by reference

herein; including business and economic conditions in the geographic regions in which we operate, Canadian housing and household indebtedness, information technology and cyber risks, geopolitical uncertainty, environmental and social risk (including climate change), digital disruption and innovation, privacy, data and third-party related risks, regulatory changes, culture and conduct risks, the effects of changes in government fiscal, monetary and other policies, tax risk and transparency, and the emergence of widespread health emergencies or public health crises such as pandemics and epidemics, including the COVID-19 pandemic and its impact on the global economy, financial market conditions and our business operations, and financial results, condition and objectives. Additional factors that could cause actual results to differ materially from the expectations in such forward-looking statements can be found in the risk section of the 2022 Management's Discussion and Analysis.

We caution that the foregoing list of risk factors is not exhaustive and other factors could also adversely affect our results. When relying on our forward-looking statements to make decisions with respect to us or the Securities, investors and others should carefully consider the foregoing factors and other uncertainties and potential events. Material economic assumptions underlying the forward-looking statements contained in this prospectus are set out in the Economic, market and regulatory review and outlook section and for each business segment under the Strategic priorities and Outlook headings in our 2022 Management's Discussion and Analysis. Except as required by law, we do not undertake to update any forward-looking statement, whether written or oral, that may be made from time to time by us or on our behalf.

Additional information about these and other factors can be found in the risk sections of the 2022 Management's Discussion and Analysis incorporated by reference in this prospectus.

**Royal Bank of Canada**  
**Senior Note Program**  
**Index Linked Securities**  
**Maximum US\$20,000,000 (200,000 Securities)**  
**RBC LiONS™ S&P 500 Linked Fixed 8.65% Securities (USD), Series 21, F-Class**  
**Due January 31, 2024**  
**Non-Principal Protected Securities**

<b>Issuer:</b>	Royal Bank of Canada (the “ <b>Bank</b> ”)
<b>Dealers:</b>	RBC Dominion Securities Inc. (“ <b>RBC DS</b> ”) and Richardson Wealth Limited Richardson Wealth Limited, a dealer to which we are neither related nor connected, participated in the due diligence activities performed by the Dealers in respect of the offering, but did not participate in the structuring and pricing of the offering or the calculation of the initial estimated value of the Securities. See “Plan of Distribution” in the program supplement.
<b>Issue:</b>	RBC LiONS™ S&P 500 Linked Fixed 8.65% Securities (USD), Series 21, F-Class due January 31, 2024.
<b>Fundserv Code:</b>	RBC3121
<b>Objective of the Securities:</b>	The Securities have been designed to provide investors with monthly Interest Payments (defined below) where the investors are willing and can afford to risk substantially all of the Principal Amount (defined below) of their investment because they believe that the Final Index Level (defined below) will be greater than or equal to the Protection Barrier Level (defined below).
<b>Issue Price:</b>	The Securities will be issued at a price equal to their Principal Amount.
<b>Minimum Investment:</b>	50 Securities or US\$5,000.
<b>Denomination:</b>	Securities are issuable in denominations of US\$100 (the “ <b>Principal Amount</b> ”) and in minimum increments of US\$100.
<b>Issue Date:</b>	February 1, 2023 or such other date as may be agreed to by the Bank and the Dealers.
<b>Issue Size:</b>	The maximum issue size will be an aggregate amount of US\$20,000,000.
<b>Maturity Date:</b>	January 31, 2024 (approximately a one-year term). See “Description of the Index Linked Securities – Maturity Date and Amount Payable” in the product supplement.
<b>Principal at Risk Securities:</b>	All but 1% of the Principal Amount of the Securities is fully exposed. You could lose substantially all of your investment. See “Description of the Index Linked Securities — Principal at Risk Securities” and “Risk Factors” in the product supplement. The monthly Interest Payments will accrue and be paid on the Principal Amount of the Securities and will not be contingent on or related to the price performance of the Index (defined below).
<b>Index:</b>	The payment at maturity on the Securities is linked to the price performance of the S&P 500® Index (the “ <b>Index</b> ”). See “Description of the Index Linked Securities — Indices” in the product supplement. See Appendix A to this pricing supplement for summary information regarding the Index. Securities do not represent an interest in the Index or in the securities of the companies that comprise the Index, and holders will have no right or entitlement to such securities including, without limitation, redemption rights (if any), voting rights or rights to receive dividends or other distributions paid on such securities (the annual dividend yield on the Index as of December 30, 2022 was 1.761%, representing an aggregate dividend yield of approximately 1.761% compounded annually over the one-year term, on the assumption that the dividend yield remains constant). There is no requirement for the Bank to hold any interest in the Index or in the securities of the companies that comprise the Index.

This pricing supplement has been prepared for the sole purpose of assisting prospective investors in making an investment decision with respect to the Securities. This pricing supplement relates only to the Securities offered hereby and does not relate to the Index and/or the Index Sponsor (defined below). The Bank and the Dealers have not verified the accuracy or completeness of any information pertaining to the Index or determined whether there has been any omission by the Index Sponsor to disclose any facts, information or events which may have occurred prior to or subsequent to the date as of which any information has been furnished by the Index Sponsor which may affect the significance or accuracy of such information. Neither the Bank nor any Dealer makes any representation that such publicly available documents or any other publicly available information regarding the Index or Index Sponsor is accurate or complete. Prospective investors should independently investigate the Index and the Index Sponsor and decide whether an investment in the Securities is appropriate. The Index Sponsor has not participated in the preparation of this pricing supplement and the Securities are not in any way sponsored, endorsed, sold or promoted by the Index Sponsor. See “Description of the Index Linked Securities – Indices” in the product supplement.

<b>Index Sponsor:</b>	“ <b>Index Sponsor</b> ” means S&P Dow Jones Indices.
<b>Initial Index Level:</b>	The “ <b>Initial Index Level</b> ” is the Closing Level (defined below), as published by the Index Sponsor, on January 26, 2023 (the “ <b>Initial Valuation Date</b> ”).
<b>Protection Barrier Level:</b>	The “ <b>Protection Barrier Level</b> ” for the Index is 75.00% of the Initial Index Level.
<b>Final Index Level:</b>	The “ <b>Final Index Level</b> ” is the Closing Level, as published by the Index Sponsor, on January 26, 2024 (the “ <b>Final Valuation Date</b> ”).
<b>Closing Level:</b>	The “ <b>Closing Level</b> ” on any date is the official closing level of the Index quoted on <a href="http://www.spglobal.com/spdji">www.spglobal.com/spdji</a> for such date, as determined by the Calculation Agent (defined below). The official closing level of the Index is available from other sources, such as Bloomberg; however, neither the Bank nor the Dealers make any representation as to the accuracy of such information and all calculations regarding the Closing Level will be made by the Calculation Agent.
<b>Interest Payments:</b>	Holder will receive interest payments (the “ <b>Interest Payments</b> ” and each an “ <b>Interest Payment</b> ”) at a fixed interest rate of 0.7208% per Interest Period (defined below), payable monthly on each Interest Payment Date (defined below). On the basis of the foregoing, the interest on each US\$100 Principal Amount of Securities for an Interest Period would equal $US\$100 \times 0.7208\%$ , or US\$0.7208. The Interest Payments will not be contingent on or related to the price performance of the Index.
<b>Interest Periods:</b>	The “ <b>Interest Period</b> ” for an Interest Payment is the period from and including the most recent Interest Payment Date to but excluding the subsequent Interest Payment Date, provided that the first Interest Period will commence on, and include, the Issue Date and the final Interest Period will end on, but exclude, the Maturity Date.
<b>Interest Payment Dates:</b>	The “ <b>Interest Payment Date</b> ” for the payment of interest will occur on March 1, 2023 and on the 1 <sup>st</sup> day of each month thereafter to and including the Maturity Date (with the exception of the Maturity Date, being January 31, 2024). If any such Interest Payment Date is not a Business Day (defined below), the payment will be made on the first following day that is a Business Day.
<b>Business Day:</b>	A “ <b>Business Day</b> ” is any day which is not a Saturday, Sunday or a day on which banking institutions are authorized or required by law or regulation to be closed in either the city of Toronto, Ontario or the city of New York, New York.
<b>Payment at Maturity:</b>	On the Maturity Date, the amount payable (the “ <b>Redemption Amount</b> ”) for each US\$100 Principal Amount per Security will be equal to: (a) if the Final Index Level is greater than or equal to the Protection Barrier Level, US\$100; or

(b) if the Final Index Level is less than the Protection Barrier Level, an amount equal to  $US\$100 \times (X_f / X_i)$ , but in any event not less than US\$1.00,

where:

“ $X_f$ ” means the Final Index Level, and

“ $X_i$ ” means the Initial Index Level.

As a result, the Redemption Amount will not be determinable before the Final Valuation Date. See “Risk Factors” below.

The Redemption Amount will be paid in addition to the Interest Payment that is due on the Maturity Date.

**Sample Calculations:**

See Appendix B to this pricing supplement for sample calculations of the Redemption Amount and the Interest Payments payable on the Securities.

**Issuer Credit Rating:**

Moody’s: Aa1

Standard & Poor’s: AA-

DBRS: AA

The Securities themselves have not been and will not be rated. See “Description of the Securities — Ratings” in the program supplement.

**Extraordinary Events:**

Determination of the Closing Level, including the Initial Index Level and/or the Final Index Level, and the Redemption Amount may be postponed, or the Bank can accelerate determination of the Final Index Level and the Redemption Amount and repay the Securities in full prior to their maturity, in certain circumstances. If an Extraordinary Event occurs then the Calculation Agent may, but is not required to, make such adjustments to any payment or other term of the Securities as it determines to be appropriate, acting in good faith, to account for the economic effect of such event on the Securities and determine the effective date of any such adjustment. See “Description of the Securities — Special Circumstances” in the program supplement and “Description of the Index Linked Securities — Extraordinary Events” in the product supplement.

**Summary of Fees and Expenses:**

No sales commission will be payable in connection with this issuance of Securities. The Bank will pay, from the Bank’s own funds, an agency fee to Richardson Wealth Limited in an amount up to 0.15% of the Principal Amount of the Securities issued under this offering for acting as independent agent. The agency fee is indirectly borne by holders of the Securities. There are no fees directly payable by a holder of Securities. See “Description of the Securities — Summary of Fees and Expenses” in the program supplement.

**Eligibility for Investment:**

Eligible for RRSPs, RRIFs, RESPs, RDSPs, DPSPs and TFSA. See “Eligibility for Investment” in Appendix C, including the summary of the “prohibited investment” rule.

**Risk Factors:**

You should carefully consider all the information set out in this prospectus for any Securities in which you are considering investing. **In particular, you should evaluate the risks described under “Risk Factors” in each of the base shelf prospectus and the product supplement, as well as the risks described below.** The Redemption Amount payable on the Securities at maturity is unknown and subject to many variables, including interest rate fluctuations and changes in the Index levels. You should independently determine, with your own advisors, whether an investment in the Securities is suitable for you having regard to your own investment objectives and expectations.

*No Upside Participation by the Securities*

The return on the Securities is limited; even if the Final Index Level is greater than or equal to the Protection Barrier Level, the maximum return on the Securities, over the term of the Securities, would be equal to US\$8.65 per Security. The Securities will not participate in any upside performance of the Index, and in the event of any increase in

the level of the Index, holders will only receive their principal at maturity in addition to the Interest Payments.

*Uncertain Redemption Amount until Final Valuation Date*

There can be no assurance that the objectives of the Securities will be achieved. Other than the regular Interest Payments payable during the term of the Securities (which are not contingent on or related to the price performance of the Index), depending on the price performance of the Index, holders of the Securities may not be repaid the amount they invested in the Securities (other than US\$1.00 per Security). Historical levels of the Index should not be considered as an indication of the future price performance of the Index. Investors should understand that the risk involved in this type of investment is greater than that normally associated with other types of investments.

*Volatility May Affect the Redemption Amount or Trading Value of the Securities*

Volatility is the term used to describe the size and frequency of price and/or market fluctuations. If the volatility, or anticipated volatility, of the Index changes over the term of the Securities, the trading value of the Securities may be adversely affected. In periods of high volatility, the likelihood of an investor not receiving a return of the full Principal Amount of the Securities increases.

*The Initial Estimated Value of the Securities Is Less than the Price to the Public and May not Reflect the Secondary Market Price, if any, of the Securities*

The initial estimated value set forth on the cover page of this pricing supplement does not represent a minimum price at which the Bank, RBC DS or any of our affiliates would be willing to purchase the Securities in any secondary market (if any exists) at any time. If you attempt to sell the Securities prior to maturity, their market value may be lower than the initial estimated value and the price you paid for them. This is due to, among other things, changes in the level of the Index and the inclusion in the price to the public of the agency fee, as well as an amount retained by the Bank to compensate it for the creation, issuance and maintenance of the Securities (which may or may not also include any costs of its hedging obligations thereunder). These factors, together with various market and economic factors over the term of the Securities, could reduce the price at which you may be able to sell the Securities in any secondary market and will affect the value of the Securities in complex and unpredictable ways. Even if there is no change in market conditions or any other relevant factors, the price, if any, at which you may be able to sell your Securities prior to maturity may be less than your original purchase price. The Securities are not designed to be short-term trading instruments. Accordingly, you should be able and willing to hold your Securities to maturity.

*The Initial Estimated Value of the Securities Is an Estimate Only, Calculated as of the Time the Terms of the Securities Were Set*

The initial estimated value of the Securities is based on the value of the Bank's obligation to make the payments on the Securities. The return on the Securities can be replicated by purchasing and selling a combination of financial instruments, such as call options and put options. The fair value of the financial instrument components that would replicate the return on the Securities is equal to the fair value of the Securities. The Bank's estimate is based on a variety of assumptions, which may include expectations as to dividends, interest rates, the Bank's internal funding rates and volatility, and the term to maturity of the Securities. The Bank's internal funding rates may differ from the market rates for the Bank's conventional debt securities. These assumptions are based on certain forecasts about future events, which may prove to be incorrect. Other entities may value the Securities or similar securities at a price that is significantly different than the Bank does. The value of the Securities at any time after the date of this pricing supplement will vary based on many factors, including changes in market conditions, and cannot be predicted with accuracy. As a result, the actual value you would receive if you sold the Securities in the secondary market, if any, should be expected to differ materially from the initial estimated value of the Securities.



**Preparation of Initial Estimated Value:**

The Securities are debt securities of the Bank, the return on which is linked to the price performance of the Index. In order to satisfy the Bank's payment obligations under the Securities, the Bank may choose to enter into certain hedging arrangements (which may include call options, put options or other derivatives) on the Issue Date which may or may not be with RBC DS or one of our other subsidiaries. The terms of these hedging arrangements, if any, take into account a number of factors, including the Bank's creditworthiness, interest rate movements, the volatility of the Index, and the term to maturity of the Securities.

The price of the Securities to the public also reflects the agency fee, as well as an amount retained by the Bank to compensate it for the creation, issuance and maintenance of the Securities (which may or may not also include any costs of its hedging obligations thereunder). The initial estimated value for the Securities shown on the cover page will therefore be less than their public offering price. See "Risk Factors – The Initial Estimated Value of the Securities Is Less than the Price to the Public and May not Reflect the Secondary Market Price, if any, of the Securities" above.

The Bank has adopted written policies and procedures for determining the fair value of Securities issued by it pursuant to the Senior Note Program. These policies and procedures include: (a) methodologies used for valuing each type of financial instrument component that can be used in combination to replicate the return of the Securities; (b) the methods by which the Bank will review and test valuations to assess the quality of the prices obtained as well as the general functioning of the valuation process; and (c) how to deal with conflicts of interest.

**Suitability for Investment:**

You should consult with your advisors regarding the suitability of an investment in the Securities. The Securities may be suitable for:

- investors who believe that the Final Index Level will be above the Protection Barrier Level
- investors who are willing and can afford to risk substantially all of the principal amount of their investment
- investors seeking an investment product with exposure to the large-cap segment of the United States equity market
- investors looking to earn a fixed-rate return and who are prepared to assume the risks associated with an investment linked to the price performance of the Index
- investors with an investment horizon equal to the term to maturity of the Securities who are prepared to hold the Securities until maturity
- investors who understand that the potential return on the Securities is limited; the maximum return on the Securities is equal to US\$8.65 per Security

**Book-entry Only Securities:**

The Securities will be Fundserv Securities (defined in the program supplement) and will be issued through the "book-entry-only system". See "Description of the Securities – Global Securities" and "– Legal Ownership" in the program supplement.

If the Securities are issued in fully registered and certificated form in the circumstances described in the program supplement under "Description of the Securities – Legal Ownership – Book-Entry-Only Fundserv Securities", the Interest Payments will be paid by the Bank to the registered holder.

**Listing:**

The Securities will not be listed on any stock exchange. See "Risk Factors" in the product supplement.

**Secondary Market:**

Securities may be purchased through dealers and other firms that facilitate purchase and related settlement using the Fundserv network. Securities may be resold using the Fundserv network at a sale price equal to the price posted on Fundserv as of the close of business on the Exchange Day (defined in the product supplement) on which the order is placed, as determined by and posted to Fundserv by the Calculation Agent, which sale price may be lower than the Principal Amount of such Securities. Generally, to be effective on a Business Day, a redemption request will need to be

initiated by 2:00 p.m. (Toronto time) on that Business Day (or such other time as may be established by Fundserv). Any request received after such time will be deemed to be a request sent and received on the next following Business Day. See “Risk Factors – The Initial Estimated Value of the Securities Is Less than the Price to the Public and May not Reflect the Secondary Market Price, if any, of the Securities” above and “Secondary Market for Securities – Fundserv” in the program supplement.

Information regarding the Closing Level, the Protection Barrier Level and the daily closing price for the Securities may be accessed at [www.rbcnotes.com](http://www.rbcnotes.com). There is no assurance that a secondary market for the Securities will develop or be sustained. See “Secondary Market for Securities” in the program supplement.

**Fiscal Agent:** RBC DS. See “Description of the Securities – Fiscal Agency, Calculation Agency and Fundserv Depository Agreement” in the program supplement.

**Calculation Agent:** RBC DS. See “Description of the Securities – Calculation Agent” in the program supplement and “Risk Factors” in the product supplement.

**Tax:** An initial purchaser of Securities who acquires Securities from the Bank on the Issue Date and who, at all relevant times, for purposes of the *Income Tax Act* (Canada), is an individual (other than a trust), is a resident of Canada, deals at arm’s length with and is not affiliated with the Bank, and acquires and holds the Securities as capital property will be required to include in computing income all interest received or receivable on the Securities, as well as certain accrued interest thereon on a disposition thereof. If, on maturity or other disposition (including on early repayment in full by the Bank), such a holder receives an amount that is less than the adjusted cost base of the Securities, such holder will realize a capital loss equal to the shortfall. All amounts relating to the acquisition, holding or disposition of the Securities must be converted into Canadian dollars on the relevant day for Canadian income tax purposes. See “Certain Canadian Tax Considerations” in Appendix C. **Potential purchasers of Securities should consult with their own tax advisors having regard to their particular circumstances.**

## APPENDIX A

### Summary Information Regarding the Index

The following is a summary description of the S&P 500<sup>®</sup> Index based on information obtained from the Index Sponsor's website at [www.spglobal.com/spdji](http://www.spglobal.com/spdji).

<b>Index</b>	S&P 500 <sup>®</sup> Index
<b>Country</b>	United States of America
<b>Current Exchanges</b>	New York Stock Exchange; The NASDAQ Stock Market; Chicago Board Options Exchange
<b>Index Sponsor</b>	S&P Dow Jones Indices
<b>Number of Component Securities</b>	503
<b>Method of Calculation</b>	Market Capitalization Weighted
<b>Closing Level (December 30, 2022)</b>	3,839.50

#### General Description

We have obtained all information regarding the S&P 500<sup>®</sup> Index contained herein, including its make-up, method of calculation and changes in its components, from publicly available information. That information reflects the policies of, and is subject to change by, S&P Dow Jones Indices ("S&P DJI"). S&P DJI has no obligation to continue to publish, and may discontinue publication of, the S&P 500<sup>®</sup> Index.

The S&P 500<sup>®</sup> Index is the most widely accepted barometer of the U.S. market. It includes 500 blue-chip, large-cap stocks, which together represent about 80% of the total U.S. equities market. Companies eligible for addition to the S&P 500<sup>®</sup> Index have a market capitalization of at least US\$14.6 billion. S&P DJI chooses companies for inclusion in the S&P 500<sup>®</sup> Index with the aim of achieving a distribution by broad industry groupings that approximates the distribution of these groupings in the common stock population of its stock guide database, which S&P DJI uses as an assumed model for the composition of the total market. Relevant criteria employed by S&P DJI include the viability of the particular company, the extent to which that company represents the industry group to which it is assigned, the extent to which the market price of that company's common stock is generally responsive to changes in the affairs of the respective industry and the market value and trading activity of the common stock of that company. S&P DJI may from time to time, in its sole discretion, add companies to, or delete companies from, the S&P 500<sup>®</sup> Index to achieve the objectives stated above. S&P DJI calculates the S&P 500<sup>®</sup> Index by reference to the prices of the S&P DJI constituent stocks without taking account of the value of dividends or other distributions paid on such stocks.

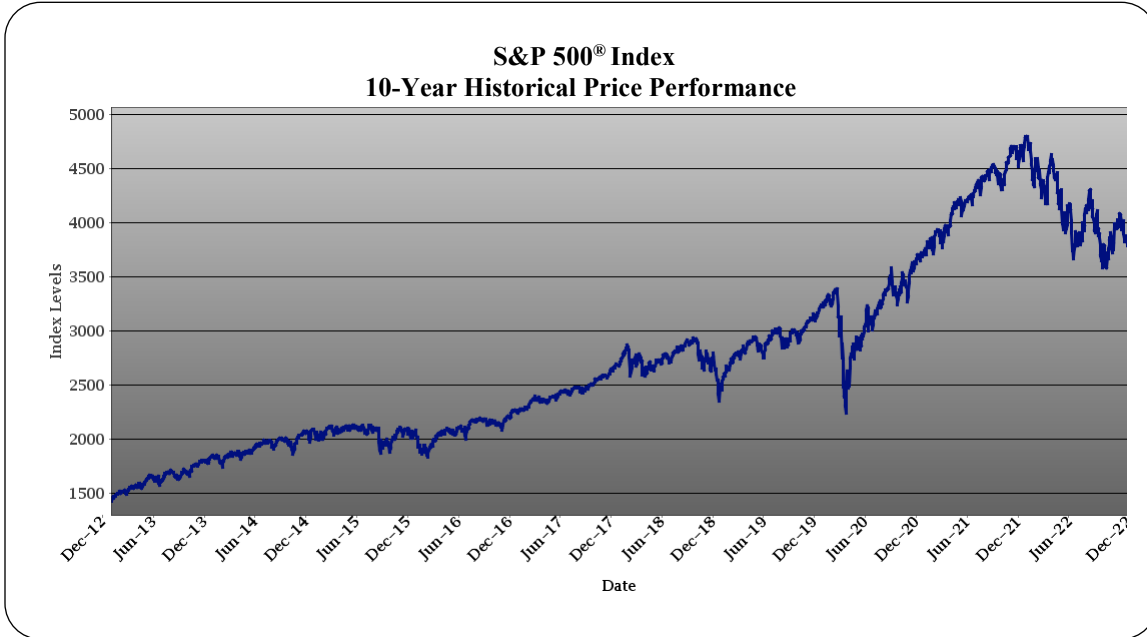
S&P DJI currently computes the S&P 500<sup>®</sup> Index as of a particular time as follows: the product of the market price per share and the number of then outstanding shares of each component stock is determined as of that time (referred to as the "market value" of that stock); the market values of all component stocks as of that time are aggregated; the mean average of the market values as of each week in the base period of the years 1941 through 1943 of the common stock of each company in a group of 500 substantially similar companies is determined; the mean average market values of all these common stocks over the base period are aggregated (the aggregate amount being referred to as the "base value"); the current aggregate market value of all component stocks is divided by the base value; and the resulting quotient, expressed in decimals, is multiplied by ten. While S&P DJI currently employs the above methodology to calculate the S&P 500<sup>®</sup> Index, no assurance can be given that S&P DJI will not modify or change this methodology in a manner that may affect the amount payable at maturity to beneficial owners of the Securities. S&P DJI adjusts the foregoing formula to offset the effects of changes in the market value of a component stock that are determined by S&P DJI to be arbitrary or not due to true market fluctuations. These changes may result from causes such as the issuance of stock dividends; the granting to shareholders of rights to purchase additional shares of stock; the purchase of shares by employees pursuant to employee benefit plans; consolidations and acquisitions; the granting to shareholders of rights to purchase other securities of the issuer; the substitution by S&P DJI of particular component stocks in the S&P 500<sup>®</sup> Index; or other reasons. In these cases, S&P DJI first recalculates the aggregate market value of all component stocks, after taking account of the new market price per share of the particular component stock or the new number of outstanding shares of that stock or both, as the case may be, and then determines the new base value in accordance with the following formula:

$$\text{Old Base Value} \times \frac{\text{New Market Value}}{\text{Old Market Value}} = \text{New Base Value}$$

The result is that the base value is adjusted in proportion to any change in the aggregate market value of all component stocks resulting from the causes referred to above to the extent necessary to negate the effects of these causes upon the S&P 500<sup>®</sup> Index.

**Historical Price Performance**

The following chart sets forth the historical level of the S&P 500® Index for the period from December 31, 2012 to December 30, 2022. Historical price performance does not take into account distributions or dividends paid on the securities underlying the S&P 500® Index.



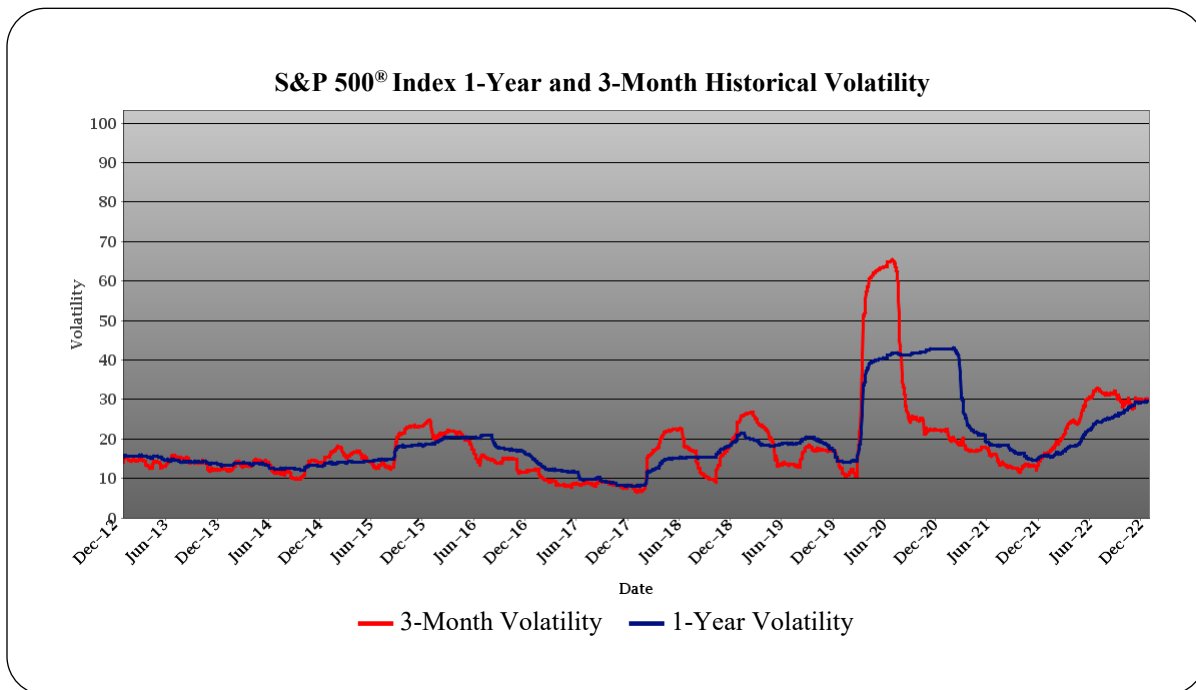
**Historical price performance of the S&P 500® Index will not necessarily predict future price performance of the S&P 500® Index or the Securities.** The source of the data displayed in this chart is Bloomberg L.P. and its accuracy cannot be guaranteed.

Historical annual percentage change of the S&P 500® Index											
Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Percentage change (%)	13.40	29.60	11.39	-0.73	9.54	19.42	-6.24	28.88	16.26	26.89	-19.44

Source: Bloomberg L.P.: Measures annualized period as of December 31 of the previous year.

The following chart sets forth the one-year and three-month historical volatility of the S&P 500® Index for the period from December 31, 2012 to December 30, 2022.

**Historical volatility is not a guarantee of future volatility.**



The source of the data displayed in this chart is Bloomberg L.P. and its accuracy cannot be guaranteed.

Volatility is the term used to describe the magnitude and frequency of the changes in a security’s value over a given time period. A higher volatility means that a security’s value can potentially be spread out over a larger range of values. This means that the price of the security can change dramatically over a short time period in either direction. A lower volatility means that a security’s value does not fluctuate dramatically, but changes in value at a steady pace over a period of time.

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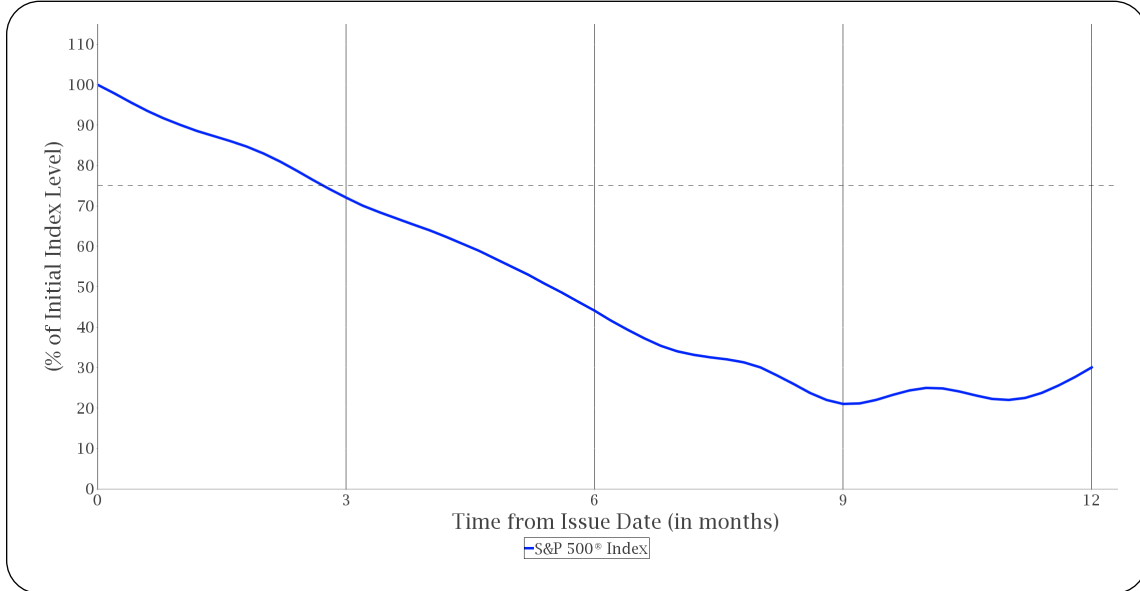
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## APPENDIX B

### Sample Calculations of Redemption Amount and Interest Payments

The examples set out below are included for illustration purposes only. The levels of the Index used to illustrate the calculation of the Redemption Amount are not estimates or forecasts of the Initial Index Level and Final Index Level, on which the calculation of the Redemption Amount will depend. All examples below assume that a holder of the Securities has purchased Securities with an aggregate principal amount of US\$100.00, that no Extraordinary Event has occurred and a Protection Barrier Level of 75.00% of the Initial Index Level. For convenience, each vertical line in the charts below represents the Interest Payment Date falling on the next succeeding quarter. Certain dollar amounts are rounded to the nearest whole cent.

#### Example #1 — Index Significantly Decreases With Payment on the Maturity Date Less Than the Principal Amount



In this scenario, on the Final Valuation Date, the Final Index Level is below the Protection Barrier Level. The Index has an Initial Index Level ( $X_i$ ) of 3,839.50 and a Final Index Level ( $X_f$ ) of 1,151.85. Therefore, the Redemption Amount would be calculated as follows:

$$\begin{aligned} & \text{Principal Amount of Securities} \times (X_f / X_i) \\ & \text{US\$100} \times (1,151.85 / 3,839.50) = \text{US\$30.00} \end{aligned}$$

Since the monthly coupon of US\$0.7208 per Security is not contingent on or related to the performance of the Index, the total Interest Payments during the term of the Securities are as follows:

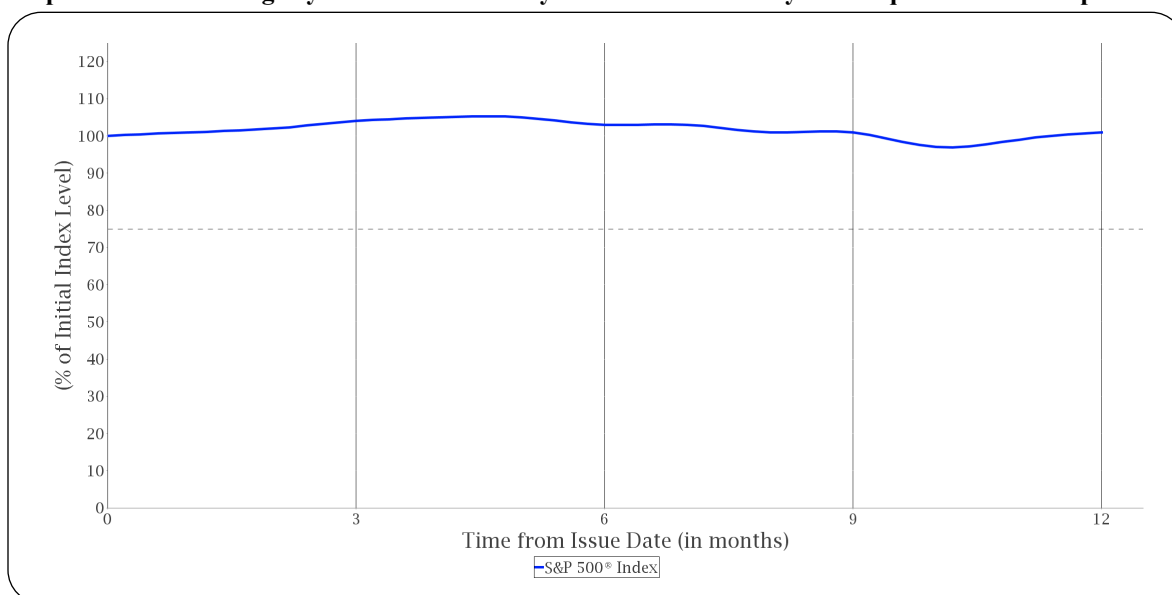
$$\begin{aligned} & \text{Principal Amount of Securities} \times 0.7208\% \text{ per Interest Period} \times 12 \text{ Interest Periods} \\ & \text{US\$100} \times 0.7208\% \times 12 = \text{US\$8.65} \end{aligned}$$

Therefore, the total amounts payable to the holder of a Security during the 12-month period from the Issue Date to the Maturity Date are:

- (a) Redemption Amount: US\$30.00
- (b) Total Interest Payments made: US\$8.65
- (c) Total amount paid over the term of the Securities: US\$38.65

The equivalent annually compounded rate of return in this example is -61.35%.

**Example #2 — Index Slightly Decreases With Payment on the Maturity Date Equal to the Principal Amount**



In this scenario, on the Final Valuation Date, the Final Index Level is above the Protection Barrier Level. Therefore, the Redemption Amount would be equal to US\$100.

Since the monthly coupon of US\$0.7208 per Security is not contingent on or related to the performance of the Index, the total Interest Payments made during the term of the Securities are as follows:

$$\begin{aligned} & \text{Principal Amount of Securities} \times 0.7208\% \text{ per Interest Period} \times 12 \text{ Interest Periods} \\ & \text{US\$100} \times 0.7208\% \times 12 = \text{US\$8.65} \end{aligned}$$

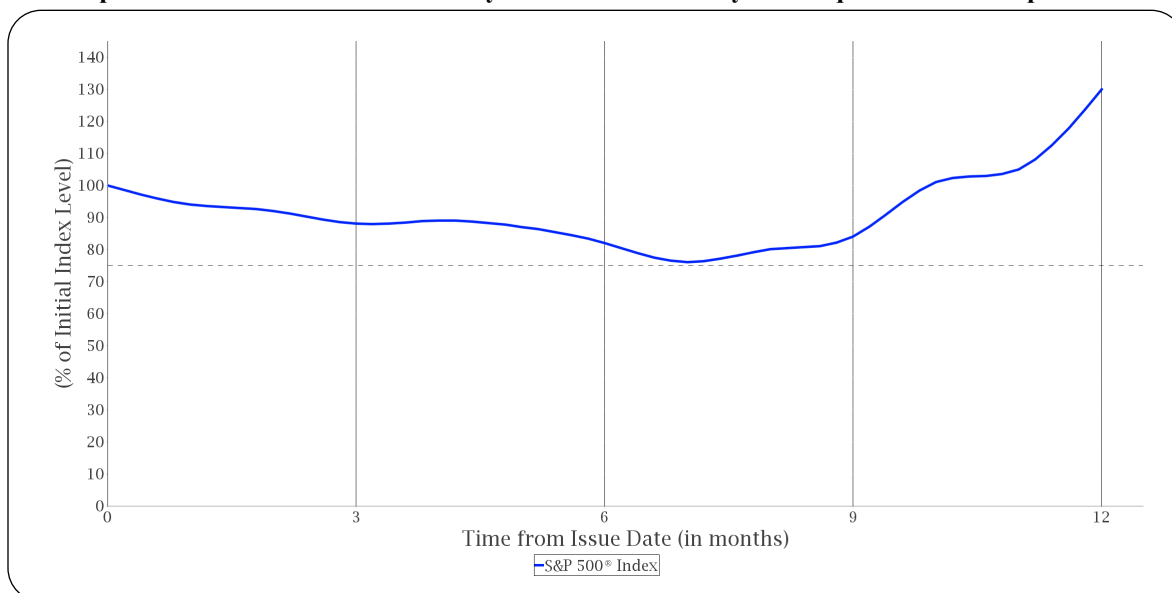
Therefore, the total amounts payable to the holder of a Security during the 12-month period from the Issue Date to the Maturity Date are:

- (a) Redemption Amount: US\$100.00
- (b) Total Interest Payments made on Interest Payment Dates: US\$8.65
- (c) Total amount paid over the term of the Securities: US\$108.65

The equivalent annually compounded rate of return in this example is 8.65%.



### Example #3 — Index Increases With Payment on the Maturity Date Equal to the Principal Amount



In this scenario, on the Final Valuation Date, the Final Index Level is above the Protection Barrier Level. Therefore, the Redemption Amount would be equal to US\$100.

Since the monthly coupon of US\$0.7208 per Security is not contingent on or related to the performance of the Index, the total Interest Payments made during the term of the Securities are as follows:

$$\begin{aligned} & \text{Principal Amount of Securities} \times 0.7208\% \text{ per Interest Period} \times 12 \text{ Interest Periods} \\ & \text{US\$100} \times 0.7208\% \times 12 = \text{US\$8.65} \end{aligned}$$

Therefore, the total amounts payable to the holder of a Security during the 12-month period from the Issue Date to the Maturity Date are:

- (a) Redemption Amount: US\$100.00
- (b) Total Interest Payments made on Interest Payment Dates: US\$8.65
- (c) Total amount paid over the term of the Securities: US\$108.65

The equivalent annually compounded rate of return in this example is 8.65%.

**APPENDIX C**  
**Certain Canadian Tax Considerations**

In the opinion of the Bank's counsel, Davies Ward Phillips & Vineberg LLP, the following summary fairly describes the principal Canadian federal income tax considerations under the *Income Tax Act* (Canada) (the "**Tax Act**") generally applicable to an initial purchaser of Securities under this pricing supplement who, at all relevant times, for purposes of the Tax Act, deals at arm's length with and is not affiliated with the Bank (a "**Holder**").

This summary is based upon the current provisions of the Tax Act and the regulations thereunder (the "**Regulations**"), all specific proposals to amend the Tax Act or such Regulations publicly announced by the federal Minister of Finance prior to the date hereof (the "**Proposals**") and counsel's understanding of the current administrative and assessing policies and practices of the Canada Revenue Agency ("**CRA**"). Except for the Proposals, this summary does not take into account or anticipate any changes (including retroactive changes) in the law or the administrative and assessing policies or practices of the CRA, whether by judicial, regulatory, governmental or legislative action, nor does it take into account tax laws of any province or territory of Canada, or of any jurisdiction outside Canada. Provisions of provincial income tax legislation vary from province to province in Canada and may differ from federal income tax legislation. No assurance can be given that the Proposals will be implemented in their current form, or at all. This summary assumes that the Holder will neither undertake nor arrange a transaction in respect of the Securities primarily for the purpose of obtaining a tax benefit, has not entered into a "derivative forward agreement" (as defined in the Tax Act) in respect of the Securities and that the Securities are not issued at a discount.

**This summary is of a general nature only and is not intended to constitute, nor should it be relied upon or construed as, tax advice to any particular Holder, nor is it exhaustive of all possible Canadian federal income tax considerations. Holders should consult their own tax advisors as to the potential consequences to them of the acquisition, ownership and disposition of Securities having regard to their particular circumstances.**

All amounts relating to the acquisition, holding or disposition of the Securities must be expressed in Canadian dollars using the rate of exchange quoted by the Bank of Canada for the day the amount first arose, or such other rate of exchange as is acceptable to the CRA.

**Holders Resident in Canada**

The following discussion applies to a Holder who, at all relevant times, for the purposes of the Tax Act and any applicable income tax treaty or convention, is an individual (other than a trust) who is resident (or deemed to be resident) in Canada and who acquires and holds the Securities as capital property (a "**Resident Holder**"). Certain Resident Holders who might not otherwise be considered to hold their Securities as capital property may, in certain circumstances, be entitled to have their Securities, and all other "Canadian securities" (as defined in the Tax Act) owned by such Resident Holders in the taxation year and all subsequent taxation years, treated as capital property by making the irrevocable election permitted by subsection 39(4) of the Tax Act.

*Interest*

The amount of any interest received or receivable (depending on the method regularly followed in computing income under the Tax Act) by a Resident Holder in a taxation year (including on redemption or repayment in full by the Bank) will be required to be included in computing the Resident Holder's income for the taxation year, except to the extent that such amount has already been included in the Resident Holder's income for that or a preceding taxation year.

*Disposition of Securities*

On a disposition or deemed disposition of a Security by a Resident Holder to a person (other than the Bank), the amount of any interest accrued on the Security to the time of disposition will be required to be included in computing the Resident Holder's income for the taxation year in which the disposition takes place (except to the extent that such accrued interest has already been included in the Resident Holder's income for that or a preceding taxation year), and will be excluded from the proceeds of disposition of the Security.

In addition, the Resident Holder should realize a capital gain (or capital loss) to the extent that the proceeds of disposition, net of amounts included in income as interest and any reasonable costs of disposition, exceed (or are exceeded by) the adjusted cost base of the Security to the Resident Holder. One-half of any capital gain realized by a Resident Holder must be included in the income of the Resident Holder. One-half of any capital loss realized by a Resident Holder is deductible against the taxable portion of capital gains realized in the year, in the three preceding years or in subsequent years, subject to the rules and restrictions contained in the Tax Act. Capital gains realized by an individual may give rise to a liability for alternative minimum tax.

*Redemption or Repayment by the Bank*

A Resident Holder who holds the Securities until maturity (or earlier redemption or repayment in full by the Bank) and who receives redemption or repayment proceeds at such time (otherwise than on account of interest) that are less than (or greater

than) the Resident Holder's adjusted cost base of such Securities will realize a capital loss (or capital gain). The income tax considerations associated with the realization of a capital loss (or capital gain) are described above.

#### **Holders Not Resident in Canada**

The following discussion applies to a Holder who, at all relevant times, for the purposes of the Tax Act is neither resident nor deemed to be resident in Canada, deals at arm's length with any Canadian resident (or deemed Canadian resident) to whom the Holder disposes of the Securities, is neither a "specified shareholder" of the Bank nor a person who does not deal at arm's length with a specified shareholder of the Bank for purposes of the "thin capitalization" rule contained in subsection 18(4) of the Tax Act, does not use or hold and is not deemed to use or hold the Securities in the course of carrying on a business in Canada and is not an insurer carrying on an insurance business in Canada and elsewhere (a "**Non-Resident Holder**").

Interest paid or credited or deemed to be paid or credited on the Securities (including any interest deemed to be paid in certain cases involving the assignment or other transfer of a Security to a resident or deemed resident of Canada) to a Non-Resident Holder will not be subject to Canadian non-resident withholding tax unless any portion of such interest is contingent or dependent on the use of or production from property in Canada or is computed by reference to revenue, profit, cash flow, commodity price or any other similar criterion or by reference to dividends paid or payable to shareholders of any class of shares of the capital stock of a corporation ("**Participating Debt Interest**"). Having regard to the terms of the Securities, interest paid or credited or deemed to be paid or credited on the Securities should not be considered to be Participating Debt Interest.

There should be no other taxes on income (including taxable capital gains) payable by a Non-Resident Holder in respect of a Security.

#### **Eligibility for Investment**

The Securities, if issued on the date of this pricing supplement, would be qualified investments (for purposes of the Tax Act) for trusts governed by registered retirement savings plans ("**RRSPs**"), registered retirement income funds ("**RRIFs**"), tax-free savings accounts ("**TFSA**s"), registered disability savings plans ("**RDSPs**"), registered education savings plans ("**RESPs**") and deferred profit sharing plans ("**DPSPs**"), each within the meaning of the Tax Act (other than a DPSP to which payments are made by the Bank or a corporation or partnership with which the Bank does not deal at arm's length within the meaning of the Tax Act).

Notwithstanding the foregoing, if Securities are "prohibited investments" (as that term is defined in the Tax Act) for an RRSP, RRIF, TFSA, RDSP or RESP, the annuitant of the RRSP or RRIF, the holder of the TFSA or RDSP, or the subscriber of the RESP, as the case may be (each a "**Plan Holder**"), will be subject to a penalty tax as set out in the Tax Act. Securities will be prohibited investments for an RRSP, RRIF, TFSA, RDSP or RESP of a Plan Holder who has a "significant interest" (as defined in the Tax Act for purposes of the prohibited investment rules) in the Bank or who does not deal at arm's length, within the meaning of the Tax Act, with the Bank.