



**NANO ONE MATERIALS CORP.**

**INTERIM MANAGEMENT DISCUSSION**

**AND**

**ANALYSIS – QUARTERLY HIGHLIGHTS**

**FOR THE PERIOD ENDED SEPTEMBER 30, 2017**

## INTERIM MANAGEMENT DISCUSSION AND ANALYSIS – QUARTERLY HIGHLIGHTS

The following Interim Management Discussion and Analysis – Quarterly Highlights (“Quarterly Highlights”) of Nano One Materials Corp. (“Nano One” or the “Company”) has been prepared to provide material updates to the business operations, liquidity and capital resources of the Company since its last management discussion & analysis, being the Management Discussion & Analysis (“Annual MD&A”) for the fiscal year ended December 31, 2016. This Quarterly Highlights does not provide a general update to the Annual MD&A, or reflect any non-material events since the date of the Annual MD&A.

This Quarterly Highlights has been prepared in compliance with the requirements of section 2.2.1 of Form 51-102F1, in accordance with National Instrument 51-102 – Continuous Disclosure Obligations. This Quarterly Highlights should be read in conjunction with the Annual MD&A, the audited financial statements of the Company for the years ended December 31, 2016 and 2015 and the unaudited condensed interim financial statements for the nine months ended September 30, 2017, together with the notes thereto. In the opinion of management, all adjustments (which consist only of normal recurring adjustments) considered necessary for a fair presentation have been included. The results for the nine months ended September 30, 2017 are not necessarily indicative of the results that may be expected for any future period. Information contained herein is presented as at November 20, 2017 (the “Report Date”), unless otherwise indicated.

The unaudited condensed interim financial statements for the nine months ended September 30, 2017, including comparatives, have been prepared in accordance with International Accounts Standards (“IAS”) 34, “Interim Financial Reporting” using accounting policies consistent with International Financial Reporting Standards (“IFRS”) as issued by the International Accounting Standards Board (“IASB”) and Interpretations issued by the International Financial Reporting Interpretations Committee (“IFRIC”).

External auditors, appointed by the shareholders, have not audited or reviewed the financial statements for the nine month period ended September 30, 2017 and did not perform the tests deemed necessary to enable them to express an opinion on these unaudited condensed interim financial statements.

For the purposes of preparing this Quarterly Highlights, management, in conjunction with the Board of Directors, considers the materiality of information. Information is considered material if: (i) such information results in, or would reasonably be expected to result in, a significant change in the market price or value of Nano One’s common shares; or (ii) there is a substantial likelihood that a reasonable investor would consider it important in making an investment decision; or (iii) it would significantly alter the total mix of information available to investors. Management, in conjunction with the Board of Directors, evaluates materiality with reference to all relevant circumstances, including potential market sensitivity.

Additional information relevant to the Company’s activities can be found on SEDAR at [www.sedar.com](http://www.sedar.com) and the Company’s website at [www.nanoone.ca](http://www.nanoone.ca). All dollar amounts included therein and in the following Quarterly Highlights are in Canadian dollars, the reporting and functional currency of the Company, except where noted.

## FORWARD LOOKING STATEMENTS

Certain statements contained in this Quarterly Highlights may constitute “forward-looking statements”. Such term is defined in applicable securities laws. The forward-looking information includes, without limitation, the success of research and development activities and other similar statements concerning anticipated future events, conditions or results that are not historical facts. These statements reflect management’s current estimates, beliefs, intentions and expectations; they are not guarantees of future performance. The Company cautions that all forward-looking information is inherently uncertain and that actual performance may be affected by a number of material factors, many of which are beyond the Company’s control. Such factors include, among others, risks relating to research and development; the Company’s intellectual property applications being approved, the Company’s ability to protect its proprietary rights from unauthorized use or disclosure, the ability of the Company to obtain additional financing; the Company’s limited operating history; the need to comply with environmental and governmental regulations; fluctuations in currency exchange rates; operating hazards and risks; competition; and other risks and uncertainties. Although the Company has attempted to identify important factors that could

cause actual actions, events or results to differ materially from those described in forward-looking information, there may be other factors that cause actions, events or results not to be as anticipated, estimated or intended. Accordingly, actual future events, conditions and results may differ materially from the estimates, beliefs, intentions and expectations expressed or implied in the forward-looking information. All statements are made as of the Report Date and, except as required by law, the Company is under no obligation to update or alter any forward-looking information.

## OVERVIEW

The Company is engaged in developing novel, scalable and low-cost processing technology for the production of high performance nano-structured materials. Nano One's mission is to establish its patent pending technology as a leading platform for the global production of a new generation of nano-structured composite materials. Nano One is building a portfolio of intellectual property and technology "know-how" for applications in markets that include energy storage, specialty ceramics, pharmaceutical, semiconductor, aerospace, dental, catalysts and communications. The technology simplifies the assembly of complex formulations of organic and inorganic ceramic powders and is suited to growth markets where the commercialization of advanced materials is inhibited by costly and entrenched industrial fabrication methods. Nano One's first market is lithium ion cathode materials in the energy storage sector, where its advantageous technology can bring sustainable differentiation and value to early adopters.

## OVERALL PERFORMANCE

The Company has no revenues, so its ability to ensure continuing operations is its ability to obtain necessary financing to complete the development of novel, scalable and low-cost processing technology for the production of high performance nano-structured materials.

Nano One's innovative processing technology can be used to produce materials used in a wide range of markets. Nano One's first addressable market is cathode materials for lithium ion rechargeable batteries for electric vehicles (EV) and energy storage systems (ESS). There is growing demand in the lithium ion battery market for more cost effective and higher performance energy storage solutions. Nano One is well positioned to address these needs with its patented and patent pending technology and anticipates growth potential for the technology in many other materials markets beyond energy storage, including dental, catalysts, specialty ceramics, pharmaceutical, semiconductor, agriculture, aerospace and communications.

Nano One has developed a new process of producing high performance cathode materials, which uses standard equipment and simple methods that are known to scale in a wide range of industrial applications. The process can produce higher performance composite materials while using lower cost feedstock and simpler processing. Nano One's patented technology is a flexible manufacturing platform that enables lithium carbonate (or hydroxide) to be used as feedstock alongside other raw materials such as nickel, manganese, cobalt, iron, phosphate and/or aluminum. It is a water based process operating at mild pH and temperature that forms the energy storing cathode materials used in lithium ion batteries. The process can be configured to produce a range of different nanostructured materials and has the flexibility to shift with emerging and future battery market trends and a diverse range of other growth opportunities.

The process consists of three stages, and the major innovations lie in the first stage where a special mode of combining reactants controls crystal nucleation and growth of particles. Nucleation is the self-assembly of molecules into an organized structure. The desired nano-scale or superfine structure is formed in the initial stage of the production cycle and eliminates many steps common to the incumbent industrial processes.

The underlying structure and morphology of the materials is preserved through a wide range of thermal processing steps, eliminating the need for long and repeated firings and indicative of a robust and more durable material. The process produces materials with stable phase composition and high porosity, but which is configurable to meet a variety of energy density requirements.

The presence of nano-structures early in the process and prior to calcination (i.e. heating to high temperature) simplifies processing and is advantageous for material performance, process throughput and scale-up.

Characterization of the materials by electron microscope and x-ray characterizes the size, the composition and the kind of structure, providing evidence of a robust structure that withstands the rigours of drying and calcination and maintains the integrity of its advantageous structure through thousands of charge cycles.

Typically, synthesis of nano-materials at the benchscale are performed in small quantities anywhere from milligrams to grams of material. Subsequent scale-up from these small quantities often leads to detrimental changes in thermodynamics (heat, temperature, energy, work) and reaction kinetics (reaction rates and chemical change). Nano One recognizes that synthesis of materials must begin at a larger scale where the properties of the system are much closer to production conditions. For this reason, Nano One designed a 6-litre bench scale reactor that is capable of producing up to 150 grams per hour (150 g/hr) or 3 kilograms per day (3 kg/day), with drying and firing stages easily scaled to match. At this scale, there is sufficient volume to emulate the thermodynamic and reaction kinetics expected in pilot and full-scale production.

### **Pilot Plant Project**

In 2016, Nano One, NORAM Engineering and Constructors Ltd. (“NORAM”) and B.C. Research Inc. (“BCRI”) entered into a collaboration agreement whereby the parties would design, procure, construct, optimize and operate a pilot production plant. The goal of the pilot plant is to simulate full scale production of lithium ion cathode materials, showcase Nano One’s patented technology and demonstrate the cost, scalability, performance and novelty of Nano One’s technology to strategic industry players. The pilot plant is capable of producing hundreds (100’s) of kilograms batches of various lithium mixed metal cathode materials that are strategically critical to electric vehicle, grid storage and consumer electronic batteries. The procurement and construction phase of the pilot project began on June 1, 2016. The construction and commissioning of the pilot plant was completed in June 2017.

A scaled-up production of lithium ion cathode materials that meet Nano One’s processing and battery capacity targets has been demonstrated. Preliminary analysis of the pilot scale process is consistent with the chemistry and operating parameters developed in the laboratory. Evaluations of the pilot produced cathode materials shows crystallinity, elemental composition and battery capacity in line with Nano One’s laboratory scale process and materials.

The pilot plant project is being supported by the Government of Canada through grants of up to \$2.08M from Sustainable Development Technology Canada (“SDTC”) and up to \$1.9M (\$679,233 claimed) from the Automotive Supplier Innovation Program (“ASIP”), a program of Innovation, Science and Economic Development Canada (“ISED”).

SDTC funds will be payable in installments over the three (3) phases of the project, namely: “build”, “commission” and “validation” with a 10% holdback awarded upon completion of the project in mid-2018. The funds are dispersed at the beginning of each phase, and are subject to Nano One meeting milestones and having matching funds in place. The Company has received two instalments totaling \$1,113,022. for the first and second phase of a lithium battery materials pilot plant project. A total of \$200,051 has been allocated as deferred government grant as at September 30, 2017.

ASIP funds will be applied to the three project phases described above with an additional phase 4 involving the validation of materials specific to the electric vehicle market. A total of \$315,032 (2016 - \$Nil) was claimed by the Company during the period ending September 30, 2017 and was received as of the Report Date.

Effective June 1, 2016, Nano One entered into a support agreement with the National Research of Canada Industrial Research Assistance Program (“NRC-IRAP”). NRC-IRAP is supporting Nano One’s project to develop High Voltage Cobalt Free Cathode Materials and will contribute up to \$222,857 (claimed - \$191,719) in non-dilutive and non-repayable funds between June 1, 2016 and November 30, 2017. Under the terms of the agreement, NRC-IRAP has agreed to reimburse the Company for 80% of salaries paid to Company employees and 50% of supported contractor fees involved in this pilot facility. The objective of the project is to develop, optimize and demonstrate Nano One’s patented processing technology for the synthesis of High Voltage Cobalt Free Cathode Material, commonly known as HV-Spinel, as a cathode material in lithium ion batteries. Under this project, Nano One will be optimizing process conditions in preparation for strategic evaluation and scaled up

production in the Pilot Plant. A total of \$114,619 (2016 - \$38,035) was claimed by the Company during the period ending September 30, 2017.

Effective June 5, 2017, the Company entered into an agreement with NRC-IRAP whereby NRC-IRAP will fund a non-repayable contribution of up to \$8,400 (claimed - \$7,040). The contribution is funded by the Youth Employment Strategy of the Government of Canada. Under the terms of the agreement, NRC-IRAP has agreed to reimburse the Company 100% of salaries paid to a process engineering assistant between the ages of 15 to 30.

Total government assistance recognized for the period ended September 30, 2017 was \$1,066,812 (2016 - \$214,167). The amount is offset against research and development expense on the statement of loss and comprehensive loss.

### **Technology**

The electric vehicle industry is transitioning to higher energy density lithium ion cathode materials with increasing proportions of nickel relative to cobalt, manganese or aluminum. Current industrial methods require lithium hydroxide as feedstock for these nickel-rich cathode materials. The flexibility of Nano One's process enables the use of lower cost lithium carbonate which Nano One believes has the opportunity to address challenges in the lithium supply chain.

Nickel rich cathode materials include nickel cobalt aluminate (NCA) and nickel manganese cobaltate (NMC-532, 622 and 811). These materials are expected to play an increasingly dominant role in the lithium ion batteries used by major electric vehicle manufacturers.

During the period ended September 30, 2017, Nano One demonstrated the synthesis of high energy cathode material for electrical vehicles using lithium carbonate feedstock with energy densities on par with industry standards. This demonstration underlines the opportunity of Nano One's technology to enable a wider range of lithium sources for the rapidly growing electric vehicle market and supplements Nano One's other opportunities in the space including improved cathode material durability, power, energy and processing cost.

Nano One's laboratory batches of NCA and NMC811 made with lithium carbonate have energy densities of 710 and 750 Wh/kg, respectively. This is comparable to the same materials made with lithium hydroxide and demonstrates a cost effective lithium alternative. The path to commercial scale is well understood from our pilot experience with NMC111 and NMC622, consequently, the technology has the opportunity to address constraints in the lithium supply chain.

### **Proprietary Protection**

Nano One has been issued U.S. Pat. No. 9,698,419. This patent expands Nano One's propriety position to include the improvements in battery performance provided by the lithium ion cathode materials produced using Nano One's process.

Nano One filed a patent relating to its innovative method of synthesizing Lithium Iron Phosphate (LFP) cathode material. The new process uses fewer steps with lower cost raw materials while eliminating waste streams, costly equipment and manufacturing complexities. LFP is considered the safest of all cathode materials in the lithium ion battery space. It is made from abundant sources of iron and phosphate, is cobalt-free, and has excellent cyclability, power and charging characteristics. It has been used extensively in electric vehicle batteries in China and will apply to those battery applications where power, charging and longevity are most critical.

Nano One filed a patent related to yield improvements in its process for the manufacture of lithium metal oxide cathode materials for use in advanced lithium ion batteries. The process improvements in this patent application have been demonstrated in the lab. Extrapolating the lab results, Nano One anticipates a 100-fold increase in the material throughput of its core technology at the reactor stage of the process. Specifically, the throughput of the existing pilot reactor could be increased from 10 kg/day, as initially conceived, to as high as 1400 kg/day. This yield is in line with current commercial production rates of cathode materials ranging from 1,000 to 10,000

kg/day. The remaining process steps are readily scalable to support the design of a full-scale plant. From industry reports, Nano One estimates that the global addressable market for cathode materials is approximately 500,000 kg/day. The pilot was designed and built to accommodate these concepts and demonstration of the elevated throughputs is expected this year. The technology was developed under the collaboration agreement between Nano One, NORAM and BCRI. Under the agreement, Nano One is assigned right, title and interest in arising intellectual property and accordingly a patent application has been filed with the U.S. Patent Office.

**LIQUIDITY AND FINANCIAL CONDITION**

The Company has not yet realized profitable operations and has relied on non-operational sources of financing to fund operations. The ability of the Company to achieve its objectives, meet its ongoing obligations and recover its investments in granted and pending patents, and other assets will depend on management’s ability to successfully execute its business plan, achieve profitable operations and obtain additional financing, if or when required. There is no assurance that these initiatives will be successful.

During the period ended September 30, 2017 the Company completed a non-brokered private placement of 4,180,000 units of the Company at a price of \$1.00 per unit for gross proceeds of \$4,180,000. Each unit consists of one share and one-half of a share purchase warrant. Each whole warrant is exercisable until September 8, 2019 to acquire one share at an exercise price of \$1.25 per share. The Company paid finders’ fee of \$145,880 and issued 145,880 finders’ warrants with a value of \$39,675. Each finders’ warrant is exercisable until September 8, 2019 to acquire one share at an exercise price of \$1.25 per share.

Loss and comprehensive loss for the period ended September 30, 2017 decreased by \$171,755. The change was primarily due to the following:

- General and administrative costs of \$1,951,575 (2016 - \$1,904,444) decreased as follows:
  - Consulting increased by \$11,749 primarily due to a increase in consulting fee paid for corporate development consulting services.
  - Salary and benefits increased by \$127,752 due to the hiring of employees.
  - Office and general, and rent increased by \$26,962 and \$25,177, respectively due to the Company moving locations and an overall increase in activity.
  - Shareholder communication and investor relations decreased by \$44,350 primarily due to a decrease in updates to the shareholder community.
  - Travel increased by \$41,568 due to an increase in meetings, seminars and conferences.
  - Research and development decreased by \$185,420 primarily due to the total government assistance recognized for the period ended September 30, 2017 of \$1,066,812 (2016 - \$214,167). The amount is offset against research and development expense on the statement of loss and comprehensive loss. There was an increase in research and development expenses due to the pilot plant project.

**Research and Development Expense for The Period Ended September 30, 2017 Compared To September 30, 2016:**

	Period Ended September 30, 2017	Period Ended September 30, 2016
Analytical services	\$ 25,947	\$ 350,862
Consulting	329,123	198,110
Depreciation	466,919	27,782
Government grant recovery	(1,066,812)	(214,167)
Lab rent	52,236	35,362
Office and lab expense	231,955	118,682
Salaries and benefits related to R&D	613,569	343,920
Travel	29,126	6,932
	<b>\$ 682,063</b>	<b>\$ 867,483</b>

- The Company recorded a non-cash share-based payments of \$195,866 (2016 – \$414,091) relating to the fair value to the current period.

Liquidity risk is the risk that the Company will not be able to meet its obligations associated with its financial liabilities. The Company has historically relied upon equity financings to satisfy its capital requirements and will continue to depend heavily upon equity capital to finance its activities. The Company’s approach to managing liquidity risk is to ensure that it will have sufficient liquidity to meet liabilities when due. The Company started 2017 with a working capital of \$2,342,719, and as at September 30, 2017, the Company had working capital of \$4,904,696. The increase in the working capital of \$2,561,977 was primarily due to:

- 595,096 warrants with an exercise price of \$0.50 were exercised for gross proceeds of \$297,548;
- 1,099,684 warrants with an exercise price of \$0.50 were exercised for gross proceeds of \$549,841;
- total government assistance recognized of \$1,066,812;
- general and administrative costs of \$1,951,575;
- 800,000 stock option were exercised for gross proceeds of \$288,000;
- completed a non-brokered private placement for gross proceeds of \$4,180,000;
- share issuance costs of \$171,849;
- issuance of a patent for \$2,220; and
- purchase of equipment and pilot plant of \$1,115,634.

Recent developments in the capital markets have restricted access to debt and equity financing for many companies. As the Company has no significant income, cash balances will continue to decline as the Company utilizes these funds to conduct its operations, unless replenished by capital fundraising.

	September 30, 2017	December 31, 2016
Working capital	\$ 4,904,696	\$ 2,342,719
Deficit	(12,084,095)	(10,066,911)

**EVENTS AFTER THE REPORTING DATE**

Subsequent to September 30, 2017, the Company piloted nickel rich cathode materials for high density energy storage application such as next generation lithium ion batteries for electric vehicles. These pilot tests were conducted at approximately 100 times normal lab scale and the results show that these nickel rich materials can be manufactured at commercial scale. Electrochemical testing of battery cells made with these pilot materials show initial capacity measurements greater than that achieved in the laboratory.

These pilot tests have shown that Nano One’s process, when scaled, can make nickel rich cathode materials using lithium carbonate in place of more costly lithium hydroxide. Nano One is currently preparing preliminary engineering packages for commercial scale production facilities and quantities of high energy cathode materials for third party evaluation.

**FUTURE PLANS**

Nano One will continue to develop, optimize and demonstrate the benefits of producing various cathode materials using its processing technology, for use in lithium ion batteries. Nano One will continue to develop High Voltage Cobalt Free Cathode Materials with the support of NRC-IRAP approved funding of up to \$222,857 towards further development.

Nano One will continue to collaborate with NORAM and BCRI to operate the pilot plant to demonstrate the production of lithium ion battery cathode powders and to demonstrate technology improvements as they arise. The engineering design and specifications of equipment follow from commercial scale concepts developed by Nano One and NORAM. Nano One will continue to provide preliminary output and optimization of cathode materials. Nano One will also continue the evaluation of other next generation lithium ion battery materials as

dictated by commercial interests. Nano One intends to ramp up the internal testing requirements with test cell assembly and electrochemical characterization.

Nano One has collaborated with Simon Fraser University to advance the understanding of the physical and chemical characteristics of lithium ion batteries as they charge and discharge. The two-year collaboration with SFU will be supervised by Associate Professor Dr. Byron Gates and Dr. Stephen Campbell, Nano One's Principal Scientist, with financial support from the Mitacs Elevate Postdoctoral Fellowship Program.

As the lithium ion battery market evolves, Nano One believes its key opportunities lie in (i) manufacturing of value added and differentiable cathode materials, (ii) enabling lithium feedstocks that others cannot use, and (iii) customizing materials for solid state, fast charging and next generation batteries. Nano One is adjusting financial models and development programs to suit.

Nano One intends to leverage progress on these plans and approach potential strategic interests and key market pull players to collaborate as partners in the demonstration pilot.

**RELATED PARTY DISCLOSURES**

Key management personnel are the persons responsible for the planning, directing and controlling the activities of the Company and includes both executive and non-executive directors, and entities controlled by such persons. The Company considers all Directors and Officers of the Company to be key management personnel.

The following transactions were carried out with related parties:

**(a) Purchases of services**

	<b>September 30, 2017</b>	<b>September 30, 2016</b>
	\$	\$
Bedrock Capital Corp., an entity controlled by Paul Matysek, an executive director is an officer, for consulting fees	45,000	45,000
Sterling Pacific Capital, an entity controlled by John Lando, an executive director is an officer, for miscellaneous operating expenses	4,575	6,818
Center Cut Capital, an entity controlled by John Lando, an executive director is an officer, for employee benefits	11,418	15,246
	60,993	67,064

**(b) Key management compensation**

Key management includes directors (executive and non-executive), the Chief Executive Officer, President and Chief Financial Officer. The compensation paid or payable to key management for employee services is shown below:

	<b>September 30, 2017</b>	<b>September 30, 2016</b>
	\$	\$
Salary and benefits to the CFO	65,667	54,000
Salary and benefits to the President and Director	56,250	56,250
Salary and benefits to CEO and Director	93,750	93,750
Share-based payments to officers and directors	-	62,367
	215,667	266,367

## **RISK AND UNCERTAINTIES**

Risk is inherent in all business activities and cannot be entirely eliminated. Our goal is to enable the Company's business processes and opportunities by ensuring that the risks arising from our business activities, the markets and political environments in which we operate is mitigated. The risks and uncertainties described in the Annual MD&A for the year ended December 31, 2016 are considered by management to be the most important in the context of the Company's business and are substantially unchanged as of the Report Date. Those risks and uncertainties are not inclusive of all the risks and uncertainties the Company may be subject to and other risks may apply.