

**INDUSTRIAL PRODUCTS**

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All figures in C\$, unless otherwise noted.

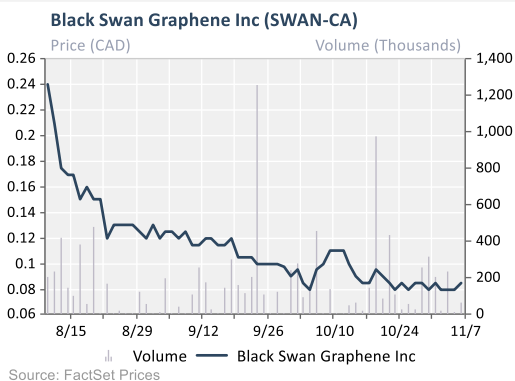
**Rating: Buy**

Initiating Coverage

**12-Month Target: \$0.60**

|                                |             |             |
|--------------------------------|-------------|-------------|
| Current Price                  |             | \$0.10      |
| Ticker                         |             | SWAN-V      |
|                                |             | BSWGF-OTCQB |
| FYE                            |             | 31-Dec      |
| Potential ROR (incl. dividend) |             | 622%        |
| Shares O/S                     | Basic (M)   | 285.3       |
|                                | FD (M)      | 285.3       |
| Market Cap                     | Basic (\$M) | 26          |
|                                | FD (\$M)    | 26          |
| Annual Dividend / Yield        | \$0.00      | 0.0%        |
| Enterprise Value (\$M)         |             | 16          |
| Net Debt (\$M)                 |             | -10         |

| PCI Est         | FY23e | FY24e | FY25e | FY26e | FY27e  |
|-----------------|-------|-------|-------|-------|--------|
| Production (Mt) | 40    | 350   | 1,000 | 4,000 | 10,000 |
| Revenue (\$M)   | 0.6   | 4.9   | 12.8  | 51.3  | 141.1  |
| EBITDA (\$M)    | (3.5) | (1.9) | 1.5   | 26.8  | 85.0   |



Source: FactSet, IBES consensus, Company filings, Paradigm Capital Inc.

**Company description:** Black Swan Graphene is a Canadian-based international bulk graphene manufacturer that is in the process of dramatically increasing its output by as much as 250 fold over the next several years. There are only two bulk graphene manufacturers in the world SWAN and NanoXplore Inc. SWAN is focusing its market penetration into the concrete and polymer verticals with a concentration on transportation applications. Graphene has a high ESG content as it replaces more fossil fuel inefficient material such as steel and carbon black, and SWAN's plans to manufacture in Quebec using hydro sourced electricity makes it a green investment on many fronts. We fully expect SWAN to generate impressive cash flow and earnings over the next five years.

## A New Bulk Graphene Player Emerges

### Investment Thesis

Black Swan Graphene (SWAN) provides investors with the opportunity to invest in an early stage but post-development high-volume graphene producer targeting the industrial markets. Black Swan's patented process is scaling up to 10,000 tpa and it is currently building a customer base to take the production. Black Swan is 41.5% owned by Mason Graphite and 15.6% by Thomas Swan Co. Ltd. U.K.

### Highlights

- ▶ **One of Two Global Bulk Graphene Producers** | While many companies work with graphene in a "research" mode, only two companies worldwide have the capability to produce graphene in industrial volumes (i.e., tonnes per year). One of these companies is Black Swan Graphene, which began trading on the TSX Venture Exchange on August 9, 2022.
- ▶ **Fully Patented Bulk Graphene Production** | Black Swan uses a fully patented graphene high shear liquid exfoliation process under license from Trinity College Dublin, which was originally expanded by Thomas Swan & Co. Ltd. U.K. who built a 40-tpa module using the technology (Thomas Swan is a 15.6% holder of Black Swan).
- ▶ **Low-cost Graphite Exfoliation Process** | SWAN's production method allows graphene to be produced for less than US\$4/kilogram at volumes above 4,000 tpa. Since selling prices are in the US\$10–US\$12/kilogram range, this can be a very profitable business.
- ▶ **Qualification of Graphene in Concrete and TPU Applications in the U.K.** | Despite current low production capacity, SWAN already has its graphene qualified in both concrete applications and TPU (thermo polyurethane) sheets in the U.K.
- ▶ **Envisioning 10,000-tpa Capacity in Quebec** | Black Swan is a Canadian company and plans to have its first high-volume production facilities in Quebec, to take advantage of the graphite availability and benefit from favourable Quebec Hydro electricity rates. SWAN will grow capacity in response to market demand.
- ▶ **Lead Customers Already "on Board"** | Black Swan has three customers ready to take graphene when it is available, including Gerdau Grapheno Ltda. and Nationwide Engineering U.K. in the concrete vertical and an undisclosed customer in the transportation vertical for TPU sheet.
- ▶ **The GEIC – A Customer Acceleration Portal** | Black Swan is a member of the Graphene Engineering Innovation Centre (GEIC) Manchester U.K. which is a development and research facility that customizes graphene to individual potential customer specs. This facility allows many applications to be pursued simultaneously without encumbering Black Swan's scientific capacity.
- ▶ **Cash Level Strong** | The company currently has \$10 million in cash which we expect will easily cover the next 2–3 years of spending.
- ▶ **Strong Management & Board** | With Harry Swan (Chairman), Simon Marcotte (President & CEO) and Michael Edwards (COO, headed Thomas Swan's graphene program), we view Black Swan as poised for success.

### Valuation & Conclusion

As our valuation model indicates (Figures 8 & 9), using a 8x EV/EBITDA multiple on 2027 estimated EBITDA of \$85 million (\$0.28/share) and discounted by 25% per year (to account for the pre-feasibility stage of development), we arrive at our one-year target price of \$0.60, which equates to 1.4x 2027 estimated revenue per share. We are initiating coverage of Black Swan Graphene with a Buy recommendation.

## Executive Summary

- Graphene is a relatively new (20 years) material that is quickly finding home as an additive replacing both steel and carbon black in various high-volume applications.
- Graphene alone is a huge contributing solution to many heavy industry ESG requirements.
- Only small amounts of graphene (1% or less load factors) are required to provide significant superior characteristics to existing materials.
- Since low volumes are required, one must target end uses that are high-volume products, such as concrete and plastics.
- To tackle these markets, one must be able to produce high volumes of graphene at a low cost.
- We believe only two companies globally have been able to achieve this to date, namely NanoXplore Inc. (GRA-T, \$13.75 TP, Buy) and Black Swan Graphene Inc.
- Black Swan was listed recently through a reverse takeover (RTO) and is in the process of increasing its production from 40 tpa toward 10,000 tpa through a number of steps. The company is commissioning an independent third-party firm to produce a scoping study to examine processes, costs and engineering of such a facility.
- Black Swan's technology is fully owned, strongly patented and was originally invented at Trinity College Dublin while being further advanced by Thomas Swan. This is quite similar to NanoXplore's technology which has been very successful at producing high-tonnage, high-quality but low-cost graphene.
- Its direct relationship with the GEIC (Graphene Engineering Innovation Center at the University of Manchester U.K.) has allowed it to have its graphene tested and engineered into over 30 different high-volume cement/concrete applications, as well as thermoplastic uses.
- Black Swan is 41%-owned by Mason Graphite Inc. (LLG-T, \$1.65 TP, Buy) and through this chain it has exposure to the Lac Guéret graphite deposit (which is very high and has the highest-grade graphite yet discovered).
- Capital costs are attractively low in the range of \$45 million for 10,000 tpa (composed of 400-tpa graphene production modules).
- Black Swan has a strong management team, both at the corporate level and on the scientific and chemical engineering sides with the ability to execute successful penetration into the graphene space.
- Black Swan is a young company and its growth curve is just beginning, as reflected in its current relatively low valuation.

**We are initiating coverage of Black Swan with a Buy recommendation and \$0.60 target. We provide the pathway for investors to evaluate the upside potential which, over time, could be significant.**

## Graphene: A Quick Primer

- Graphene was first discovered in 2004 at the University of Manchester by scientists Andrei Geim and Konstantin Novoselov who successfully produced very few layers of graphene by mechanical exfoliation of graphite.
- The exact methodology was to take a normal graphite pencil used for drawing and peel off layers of graphite using normal everyday cello tape (Scotch tape). After many repeated attempts graphite a few layers thick was achieved.
- This process, while simplistic, was also time consuming, and produced very low yields. While clearly a scientific success, it needed significant enhancement to be a commercial success.
- In its purest form graphene is one layer thick graphite (100% carbon). However, for industrial applications multi-layer thick “bulk” graphene is the best trade-off between performance, price and volume available.
- The number of layers, the graphene dispersion and the way the graphene interacts with the surrounding material all have a combined impact on the graphene performance.

## Graphene: The Miracle Material of the 21<sup>st</sup> Century

- **Tensile Strength:** 200x stronger than structural steel.
- **Electrical Conductivity:** More conductive than copper.
- **Thermal Conductivity:** 5,000 W/mk (watts per meter/Kelvin), transfers heat better than diamonds.
- **High-surface Area:** 2,630 m<sup>2</sup>/g (no material is higher).
- **Transparent:** Not visible to normal light; therefore, can be tinted any colour.
- **Stiff Yet Flexible:** As measured using Youngs Modulus ITPA.

## Graphene Production Summary

- The four main methods being used today are chemical layer separation, mechanical exfoliation, chemical/mechanical exfoliation and plasma arc creation.
- The process that is achieving the most financial success is the chemical/mechanical exfoliation method. **This is the broad process family that Black Swan Graphene and NanoXplore are using.**
- Each company has individual patented processes and the companies agree the patents do not infringe on one another.
- With regard to commercialization success, the high-volume spot in the market is for bulk graphene which can materially improve performance at a low cost.
- This thickness can be produced economically and has high-volume application, replacing carbon black in many polymer applications, but also as a stand-alone additive in many materials, including, but not limited to, concrete and asphalt.

## Bulk Graphene: The Sweet Spot

- Selling prices in the US\$10–US\$12/kilogram range and operating costs in the sub-US\$5/kilogram range provide gross margins of US\$5–US\$7/kilogram.
  - High performance in concrete and polymers.

### Only Two Companies Can Supply Bulk Quality Graphene Globally

- High-quality, high-volume and low price are the three factors required to supply industrial users with graphene as a meaningful new material in commercial products.
  - We believe only two graphene companies in the world are in a position to supply such material at a cost that can allow for rapid adoption — NanoXplore Inc. and Black Swan Graphene Inc.

### Addressable Market Is Large

- The two major verticals that dominate the graphene space by potential tonnage per year are the concrete and total polymer markets (Figure 1).
- A 10% penetration of each market would require a total of about 70 production plants of 10,000-tpa graphene each, 20 in the concrete space and 50 in the polymer space, depending on graphene loading assumptions.

**Figure 1: Graphene Market and No. of Plants**

|          | Annual<br>Production | Load  | tpa       | Plant<br>Size<br>tpa | plants | 10% mkt |
|----------|----------------------|-------|-----------|----------------------|--------|---------|
| Concrete | 20,000,000,000       | 0.01% | 2,000,000 | 10,000               | 200    | 20      |
| Polymers | 250,000,000          | 2%    | 5,000,000 | 10,000               | 500    | 50      |

Source: Company filings, Paradigm Capital Inc.

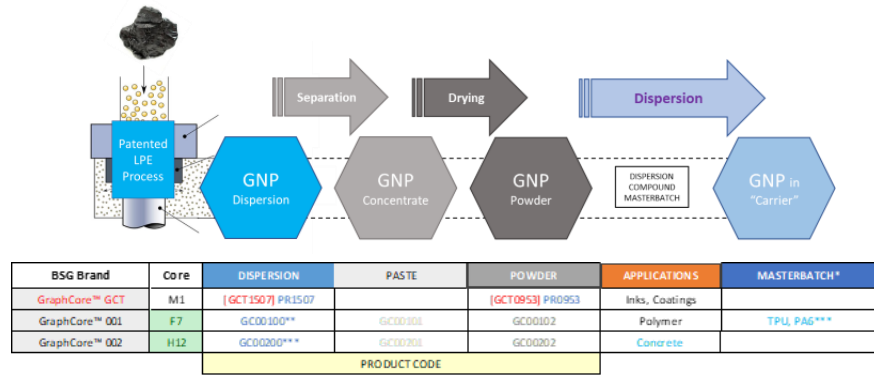
### High-shear Liquid Exfoliation High-volume Manufacturing Process

- Patented process developed by Thomas Swan under license from Trinity College University of Dublin. Black Swan owns 100% of the Trinity patent at this time.
- The process exfoliates graphite using shear force on the graphite.
- The resultant mix is then homogenized in the presence of a chemical additive into a dispersion that can then be dried to powder form.
- The process is low cost as there is no change of state — the graphite/graphene remains solid through the entire process.
- The process is also self-contained with recycled chemicals and fluids.
- Royalty is based on revenue (3% on sales up to €5 million, 2.5% on €5–€10 million, 2% on €10–€20 million and 1.5% greater than €20 million).
- SWAN has 20 patents and patent applications in nine countries, including the U.K., U.S., Canada, Germany, Italy, Spain, France, Sweden and China.

**Figure 2: Graphene Production Process**



Modular, scalable & patented process



\* - currently @ Pilot Stage [GCP104P-F07]  
 \*\* - currently @ R&D stage Product [GCR094P-H12]

\*\*\* - planning (check status)

BLACK SWANTECHNICAL OVERVIEW

Source: Company filings, Paradigm Capital Inc.

**Full Access to Thomas Swan R&D and Process Engineers**

- Graphene processing IP is owned by Black Swan but was developed by Thomas Swan.
- Black Swan has access to Thomas Swan’s labs and scientists.
- Michael Edwards, who headed the graphene effort at Thomas Swan, is COO of Black Swan.
- A core group of process engineers will be based in Canada and operate the graphene processing facility in Quebec.

**Thomas Swan & Co. Ltd. U.K.**

- A private specialty chemical company based in County Durham, England.
- Has worked on graphene for 15 years and was the sole owner of the Trinity license.
- An ISO-compliant company, hence all the graphene processing procedures are ISO-compliant which is key for quality control, repeatability and product consistency, giving customers great confidence.

## Black Swan Two-year Milestone Goals

Management has provided the following milestone goals that it is aiming to achieve over the next two years.

**Figure 3: Two-Year Milestone Summary**

| Business Objective   | Timeframe    | Est. Cost |
|--|--------------|-----------|
| Publication of independent scoping study for 10,000-tpa facility | 0-12 months  | \$200K    |
| Publication of a feasibility study for its large-scale facility  | 12-24 months | \$600K    |
| Product optimization and R&D, plus customer testing              | 0-24 months  | \$1,300K  |
| Lobbying, branding, sales, marketing & promotion                 | 0-24 months  | \$930K    |

*Source: Company filings, Paradigm Capital Inc.*

## Black Swan “on Board” Customers

Based on graphene samples produced by Black Swan, two concrete producers have signed on as customers when the company can produce sufficient volume — Gerdau Grapheno Ltda. and Nationwide Engineering U.K. for use in its Concretene™ product.

### Nationwide Engineering

- U.K.-based civil engineering firm concentrating on the rail and construction sectors.
- Owner of the patented graphene-enhanced product Concretene™.
- Concrete pours with Concretene™ have shown:
  - 30% less concrete needed
  - no rebar required
  - water repulsion
  - no micro-fracturing
  - high strength
- Nationwide has 30 projects in its current pipeline that have Concretene™ engineered into the solution, with a focus on the transportation vertical, including concrete for highways, runways and railways, among others.

### Gerdau Grapheno Ltda.

- A subsidiary of the large global steel conglomerate Gerdau S.A.
- Has signed a multi-year master distributorship agreement with Black Swan for graphene.
- Will buy products from SWAN to market, promote and resell in the Americas.
- Research facilities in Brazil and the U.K. (GEIC) working on the application of graphene to the following products:
  - Concrete
  - Elastomers
  - Polymers
  - Lubricants
  - Coatings
  - Electronic sensors

## Canadian Concrete Potential

- The Canadian cement/concrete industry has expressed interest in graphene additives.
- Having done some R&D about seven years ago, the industry put further work on hold as bulk graphene in large quantities was not available.
- The Canadian cement/concrete industry is fertile ground for Black Swan.

## Graphene Use in Concrete Is a Huge GHG Reducer

- Concrete is responsible for 8% of CO<sub>2</sub> emissions globally per annum.
- Adding less than 1% graphene by weight to concrete can allow it to be 40% stronger (i.e., the same strength can be achieved with 40% less concrete).
- In addition, steel reinforced concrete can use 40% less rebar, further adding to the reduction of CO<sub>2</sub> as less steel needs to be produced. Depending on the specific application, it has been found that rebar can be eliminated and the same strength (or stronger) can be attained with graphene-enhanced concrete.
- Less concrete volume also leads to less material transport and less labour-intensive construction methods.

## Carbon Credit Potential

Black Swan is exploring the potential of receiving value for its carbon reduction features. These could be in the form of tradable carbon credits or economic value from customers that may receive credits from using Black Swan graphene carbon credits. These could be earned from various sources, including:

- Input energy credits from using hydro-generated power to produce graphene.
- Energy-reduction credits when the graphene is used (e.g., concrete).
- Credits generated from less rebar produced.

## Polymer Vertical

- Focus on transportation sector with a particular emphasis on increasing the range of EVs through lightweighting.
- High-strength lightweight TPU (thermoplastic polyurethane) sheeting (airbags and military inflatables) — Black Swan already has a customer in this vertical.
- High-strength lightweight polymers for bodywork and under hood applications, battery boxes or internal battery foundations.

## The GEIC: A Customer Accelerator Vertical

- The Graphene Engineering Innovation Centre (GEIC) is located at the University of Manchester and promotes and facilitates the development of graphene into different products.
- Time to market for a new application is greatly reduced by using the R&D teams at GEIC.
- SWAN has executed a Tier 2 Membership with the GEIC.
- The GEIC interfaces between Black Swan and end-use customers and thus becomes a multi-pronged specific R&D function for Black Swan.
- This “portal” type function accelerates Black Swan’s market penetration significantly.
- The Nationwide Engineering and Gerdau relationships, for example, have emerged from this portal.

## ESG Play on Several Fronts

- Black Swan is a genuine ESG play on several fronts.
- Graphene is an ESG material as it significantly reduces the need for higher CO<sub>2</sub> consuming materials in both the polymer and concrete verticals.
- The potential for licensing Black Swan's process offers the concrete vertical substantial additional CO<sub>2</sub> reduction benefits by eliminating the drying process.
- Black Swan's production facilities will be based in Quebec with electricity to be supplied by existing excess hydro-electric capacity.
- The company will not only allow customers to reduce their carbon footprint but Black Swan's graphene will also be a low carbon process itself.
- Assuming Black Swan uses Lac Guéret graphite as a feedstock, the deposit's high grade (four times most other graphite deposits) means that Lac Guéret graphite requires one-quarter of the energy to extract and is significantly less to process per kilogram of ore.

## 40-tpa Pilot Plant in Place; 10,000-tpa Plant is the Goal

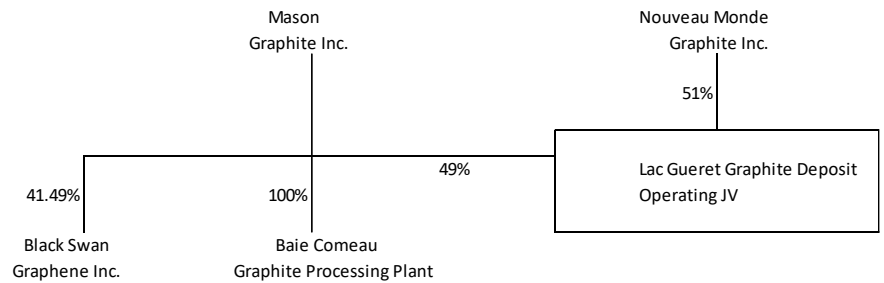
- Black Swan's low production facility is located in Thomas Swan's main facility in County Durham, U.K.
- The plant can produce 40 tpa in 6-kilogram batches.
- The first scale-up is planned to be 10x (i.e., about 400 tpa).
- Moving to 1,000 tpa and then 4,000 tpa, and onto 10,000 tpa.
- The repeatable module size is 400 tpa.
- Number of 400-tpa modules in the scale-up is 3, 10 and 25, which can be re-assessed as demand evolves.
- Multiple 400-tpa modules feed one drying unit.
- SWAN is undertaking an independent third-party scoping study of a graphene production plant, which will soon be made public and include cost parameters.
- In our view the capex for 10,000 tpa would be between \$40 million and \$50 million.

## Black Swan Will Grow Capacity at the Rate the Market Will Bear

- As clients adapt graphene to their various products, Black Swan has the ability to add modules to fit the demand curve.
- SWAN has executed an exclusive binding collaboration agreement with a key equipment supplier for the procurement of long lead graphene production equipment.
- Batch processing allows maximum production flexibility.
- The drying part of the process can be customized to handle multiple, 400 tpa modules.

## Corporate Relationship Between SWAN, LLG and NOU

- Figure 4 shows the schematic of the corporate relationships of the three companies.
- The Lac Guéret graphite deposit is the link between SWAN and NOU through LLG.
- The Lac Guéret graphite deposit located in Quebec is massive and is very high grade, with NI-43-101 (February 2016) reserves of 65.6Mt at 17.19% graphite for the first 25 years and resources beyond that of an additional 58.1Mt at 16.3% graphite.
- Few graphite deposits in the world have over 7% grade.
- The operating joint-venture agreement between Mason Graphite Inc. and Nouveau Monde Graphite Inc. (NOU-T, NR) was released July 28, 2022.

**Figure 4: SWAN, LLG, NOU Corporate Schematic**


Source: Company filings, Paradigm Capital Inc.

### Production Plant Could Be Built in Nouveau Monde Facility

- Through the Nouveau Monde Graphite and Mason Graphite joint graphite production venture, Black Swan will have access to build a graphene plant in NOU’s graphite processing plant in Saint-Michel-des-Saints, Quebec.
- This facility has the capacity to produce 1,000 tpa of graphite concentrate and is expected to produce more as it also processes the ore from the Lac Gu eret project which carries a much higher grade.
- A larger plant could be built in, or beside, a larger 100,000-tpa graphite plant being considered at the same location.
- This strategy allows Black Swan to move into commercial production quicker than a greenfield build. As clients introduce graphene to their various products, Black Swan has the ability to add modules to fit the demand curve.
- More information on the Nouveau Monde Graphite and Mason Graphite joint venture can be found in a [May 16, 2022](#) press release.

### Lac Gu eret Graphite a Possible Source of Feedstock

- Through the NOU/LLG Joint Graphite Production Venture, Black Swan will have access to Lac Gu eret graphite.
- The Lac Gu eret mine has very high graphite grades of up to 27.8% Cg and a possible 200-year mine life.
- Consequently, Lac Gu eret graphite has a low carbon footprint as the grade is four times that of most other graphite deposits.
- This unique relationship between Black Swan, Mason Graphite and Nouveau Monde Graphite allows Black Swan a unique security of graphite supply.

## Financial Forecast

In Figure 5 we provide a summary of our forecast (full forecast in Figure 11).

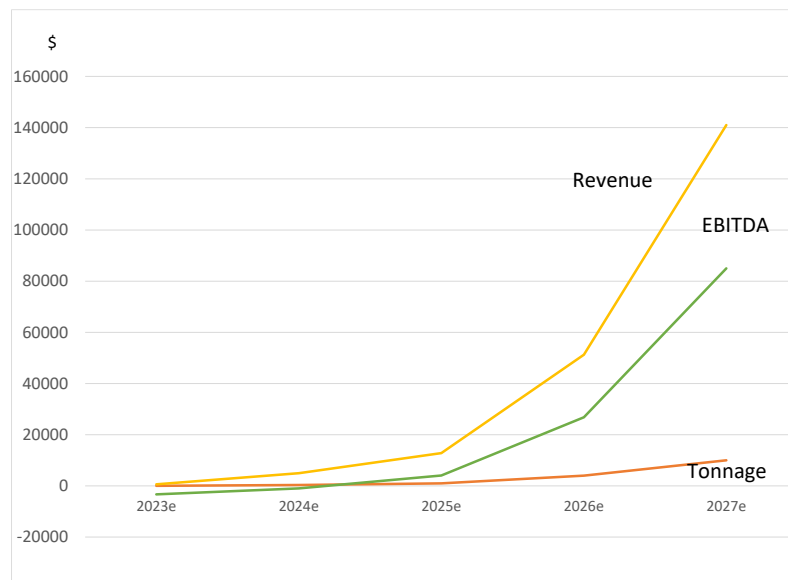
**Figure 5: Summary Financial Forecast**

| C\$000s | 2023e   | 2024e   | 2025e  | 2026e  | 2027e   |
|---------|---------|---------|--------|--------|---------|
| Tonnage | 40      | 350     | 1,000  | 4,000  | 10,000  |
| Revenue | 615     | 4,936   | 12,821 | 51,282 | 141,026 |
| EBITDA  | (3,496) | (1,855) | 1,487  | 26,819 | 84,994  |

Source: Company filings, Paradigm Capital Inc.

EBITDA growth is impressive, as shown in Figure 6. Once production moves above 4,000 tpa the EBITDA accelerates, reaching \$85 million per year (\$0.28/share).

**Figure 6: Black Swan Tonnage, Revenue and EBITDA Growth Curves**



Source: Company filings, Paradigm Capital Inc.

## Valuation

Our key valuation assumptions are:

- Based on 2027 production of 10,000 tpa.
- 2027 EBITDA forecast of \$85 million.
- An equity raise of between \$20 million and \$25 million to reach 4,000 tpa and the move to 10,000 tpa could be funded by internal cash flow.
- We provide two scenarios: 1) 325 million shares outstanding; and 2) 368 million shares outstanding.
- Discount rates of 10%, 15%, 20% and 25%.
- No debt
- EV/EBITDA of 8x, 10x and 12x.

**Figure 7: Capex Equity Raise Matrix**

|                  |              | Share Price |        |            |
|------------------|--------------|-------------|--------|------------|
|                  |              | \$0.30      | \$0.40 | \$0.50     |
| <b>Capex</b>     | <b>\$20M</b> | 67          | 50     | 40         |
| Total Shares O/S |              | 352         | 335    | <b>325</b> |
| <b>Capex</b>     | <b>\$25M</b> | 83          | 63     | 50         |
| Total Shares O/S |              | <b>368</b>  | 348    | 335        |

Source: Company filings, Paradigm Capital Inc.

**Figure 8: 325 Million Shares Outstanding Valuation Matrix**

| Capex \$20M for 4,000 tpa |              |             |      |      |
|---------------------------|--------------|-------------|------|------|
| Shares O/S 325M           | EV/EBITDA    |             |      |      |
|                           | Discount (%) | 8x          | 10x  | 12x  |
| 10                        |              | 1.37        | 1.72 | 2.06 |
| 15                        |              | 1.11        | 1.39 | 1.67 |
| 20                        |              | 0.86        | 1.07 | 1.29 |
| 25                        |              | <b>0.66</b> | 0.83 | 0.99 |

Source: Company filings, Paradigm Capital Inc.

**Figure 9: 368 Million Shares Outstanding Valuation Matrix**

| Capex \$25M for 4,000 tpa |              |             |      |      |
|---------------------------|--------------|-------------|------|------|
| Shares O/S 368M           | EV/EBITDA    |             |      |      |
|                           | Discount (%) | 8x          | 10x  | 12x  |
| 10                        |              | 1.21        | 1.52 | 1.82 |
| 15                        |              | 1.11        | 1.39 | 1.67 |
| 20                        |              | 0.76        | 0.95 | 1.14 |
| 25                        |              | <b>0.58</b> | 0.73 | 0.88 |

Source: Company filings, Paradigm Capital Inc.

Using an 8x EV/EBITDA multiple and a 25% discount rate with 368 million shares outstanding results in a one-year target price of \$0.58; using these same metrics with 325 million shares outstanding results in a target price of \$0.66. This would equate to a market cap one-year out of \$215 million. **Blending both of these metrics, our target price is \$0.60.**

## Capital Structure

### Share Ownership

- 41.49% of the shares owned by Mason Graphite Inc.
- 15.56% owned by Thomas Swan Co. Ltd. U.K. (private company)
- 2.1% by management and the board equating 17.66%, including the ownership position of Thomas Swan, which is 100%-owned by Harry Swan, Chairman of Black Swan.
- 41.2% is publicly owned, including 7.5% by Mr. Al-Timimi, Chairman of Mason Graphite Inc.

**The company has no debt and \$10 million in cash on the balance sheet.**

## Management & Board of Directors

Black Swan has an experienced management and board with two representatives from Thomas Swan plus entrepreneurs from the EV battery and industrial/mining space. Full bios are available on the corporate website and official filings.

- **Harry Swan, Chairman:** Owner and CEO of Thomas Swan.
- **Simon Marcotte: President & CEO, Director:** Mining entrepreneur.
- **Michael Edwards, COO, Director:** Former business director Thomas Swan responsible for development of the graphene business.
- **David Deak, Director:** President of Marbex LLC, working in the EV battery space. Formerly with Lithium Americas and Tesla Gigafactory 1.
- **Peter Damouni, Executive Director:** Several years of corporate development and investment banking experience in the natural resource sector and currently President and CEO of Mason Graphite and director of Arena Minerals.
- **Roy McDowall, Director:** Currently a director of Mason Graphite and senior officer of Turquoise Hills Resources Inc. Over 25 years in investment banking and corporate finance.
- **Greg Duras, CFO:** 15 years of experience in corporate and project finance in the resource sector.
- **Henri Wilhelm, Vice President, Technology:** Over 15 years of experience in R&D and development of graphite-based products for Imerys Graphite.
- **Paul Hardy, Vice President, Corporate Development:** Over 30 years in Canadian capital markets with CIBC and Desjardins Securities and also co-founder of Thorium Power Canada Inc.

## Publicly Listed Graphene Companies

We have followed the graphene space for six years and find it to be a very interesting vertical, both from a scientific and business opportunity perspective. Two significant characteristics of the space emerge:

- There are many niche players that have very low volumes of production and are accompanied by high costs which cannot be significantly reduced because of the technology of manufacturing they have embraced.
- The “sweet spot” in the industry are those companies with the ability to produce high volumes of graphene at low cost (i.e., below US\$5.00/kilogram). These players will benefit from significant revenue and high profit margins, and in our view will be very successful businesses.

As can be seen from the comparables table (Figure 10), NanoXplore and Black Swan fit into this high-volume category and hence fall into our Bulk Graphene Commercial Innovator Group, while the remainder we place in the Low Volume Research Group.

**Figure 10: Publicly Listed Graphene Companies**

|  | Market Cap<br>(\$M) |
|--|---------------------|
| <b>Bulk Graphene Commercial Innovators</b> |                     |
| NanoXplore (GRA-T)                         | 546.4               |
| Black Swan (SWAN-T)                        | 26.0                |
| <b>Low-volume Researchers</b>              |                     |
| Zentek (ZEN-T)                             | 218.6               |
| Graphene Manufacturing Group (GMG-T)       | 245.1               |
| Directa Plus PLC (DCTA-L)                  | 91.7                |
| Versarien PLC (VRS-L)                      | 40.6                |

*Source: Company filings, Paradigm Capital Inc.*

We note that at a similar point in its evolution, NanoXplore’s market cap was ~\$180 million.

**Figure 11: Income Statement**

| Income Statement      |         | 2023e        | 2024e        | 2025e        | 2026e        | 2027e         |
|-----------------------|---------|--------------|--------------|--------------|--------------|---------------|
| C\$/US\$              | 0.78    |              |              |              |              |               |
|                       | \$000's |              |              |              |              |               |
| tonnage               |         | 40           | 350          | 1000         | 4000         | 10000         |
| US\$/kg               |         | 12           | 11           | 10           | 10           | 11            |
| <b>C\$Revenue</b>     |         | <b>615</b>   | <b>4936</b>  | <b>12821</b> | <b>51282</b> | <b>141026</b> |
| COGS US\$/kg          |         | 9            | 7            | 6            | 4            | 4             |
| C\$                   |         | 462          | 3141         | 7692         | 20513        | 51282         |
| <b>Op Margin</b>      |         | <b>154</b>   | <b>1795</b>  | <b>5128</b>  | <b>30769</b> | <b>89744</b>  |
| %                     |         | 25.0%        | 36.4%        | 40.0%        | 60.0%        | 63.6%         |
| SGA                   |         | 3000         | 3000         | 3000         | 3000         | 3500          |
| %                     |         | 487.5%       | 60.8%        | 23.4%        | 5.9%         | 2.5%          |
| R&D                   |         | 650          | 650          | 641          | 950          | 1250          |
| %                     |         | 105.6%       | 13.2%        | 5.0%         | 1.9%         | 0.9%          |
| <b>EBITDA</b>         |         | <b>-3496</b> | <b>-1855</b> | <b>1487</b>  | <b>26819</b> | <b>84994</b>  |
| Dep & Amort           |         | 150          | 500          | 2000         | 2000         | 2000          |
| EBIT                  |         | -3646        | -2355        | -513         | 24819        | 82994         |
| Interest              |         | -300         | -150         | -1200        | -600         | -150          |
| <b>Pre-tax Income</b> |         | <b>-3346</b> | <b>-2205</b> | <b>687</b>   | <b>25419</b> | <b>83144</b>  |
| Income tax            |         | 50           | 65           | 600          | 4800         | 19200         |
| %                     |         | nmf          | nmf          | 87.3%        | 18.9%        | 23.1%         |
| <b>Net Income</b>     |         | <b>-3396</b> | <b>-2270</b> | <b>87</b>    | <b>20619</b> | <b>63944</b>  |
| sos                   |         | 285375       | 285375       | 325000       | 325000       | 325000        |
| <b>EPS</b>            |         | <b>-0.01</b> | <b>-0.01</b> | <b>0.00</b>  | <b>0.06</b>  | <b>0.20</b>   |

Source: Company filings, Paradigm Capital Inc.

**Figure 12: Balance Sheet**

|                                     | <b>July 31 2022</b> |
|-------------------------------------|---------------------|
| <b>ASSETS</b>                       |                     |
| <b>Current Assets</b>               |                     |
| Cash                                | 15141               |
| Receivables                         |                     |
| Prepaid Expenses                    |                     |
| <b>Total Current Assets</b>         | <b>15141</b>        |
|                                     |                     |
| Non-current assets                  |                     |
| Intangible assets                   |                     |
| <b>Total assets</b>                 | <b>15141</b>        |
|                                     |                     |
| <b>LIABILITIES AND EQUITY</b>       |                     |
| <b>Current liabilities</b>          |                     |
| Accounts payable and accrued        | 228                 |
| <b>Total liabilities</b>            | <b>228</b>          |
|                                     |                     |
| <b>Equity</b>                       |                     |
| Common shares                       | 1532761             |
| Contributed surplus                 |                     |
| Share based payment reserve         | 55735               |
| Deficit                             | (1801482)           |
| <b>Total equity</b>                 | <b>(212386)</b>     |
| <b>Total liabilities and equity</b> | <b>15141</b>        |

Source: Company filings, Paradigm Capital Inc.

## DISCLAIMER SECTION

| Company                  | Ticker  | Disclosures |
|--------------------------|---------|-------------|
| Black Swan Graphene Inc. | SWAN-CA | 3           |
| Mason Graphite Inc.      | LLG-CA  | 3           |
| NanoXplore Inc.          | GRA-CA  | 2,3         |

Note: Please refer to above table for applicable disclosure numbers.

- The analyst has an ownership position in the subject company.
- Paradigm Capital Inc. has assumed an underwriting liability for, and/or provided financial advice for consideration to the subject companies during the past 12 months.
- Paradigm Capital Inc. expects to receive or intends to seek compensation for investment banking services from the subject companies in the next 3 months.
- Paradigm Capital Inc. has greater than a 1% ownership position in the subject company.
- The analyst has a family relationship with an Officer/Director of subject company.
- A partner, director, officer, employee or agent of Paradigm Capital Inc. is an officer or director of the issuer.

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### Research Rating System

Paradigm Capital Inc. uses the following rating recommendation guidelines in its research:

| Recommendation   | Number of Companies | Percentage Breakdown |  |
|------------------|---------------------|----------------------|--|
| <b>Buy</b>       | 98                  | 62%                  | <b>Buy</b> – Expected returns of 20% or more over 12 months.   |
| <b>Spec. Buy</b> | 49                  | 31%                  | <b>Speculative Buy</b> - Expected returns of 20% or more over the next 12 months on high-risk development or pre-revenue companies, such as junior mining and other early stage companies. |
| <b>Hold</b>      | 10                  | 3%                   | <b>Hold</b> - Expected returns of less than +/- 20% over the next 12 months. Includes companies Under Review.  |
| <b>Sell*</b>     | 0                   | 0%                   | <b>Sell</b> - Expected returns of -20% or more over the next 12 months.  |
| <b>Total</b>     | 157                 |                      |  |

\*Includes companies with a "Tender" recommendation

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## STOCK RATING SYSTEM

**Buy:** Expected returns of 20% or more over 12 months.

**Speculative Buy:** Expected returns of 20% or more over the next 12 months on high-risk development or pre-revenue companies, such as junior mining and other early-stage companies.

**Hold:** Expected returns of less than 20% over the next 12 months.

**Sell:** Expected returns of -20% or more over the next 12 months.