Sprott | Equity Research

CANADIAN MANGANESE (CDMN CN)

Initiating Coverage: Best exposure to manganese for battery markets

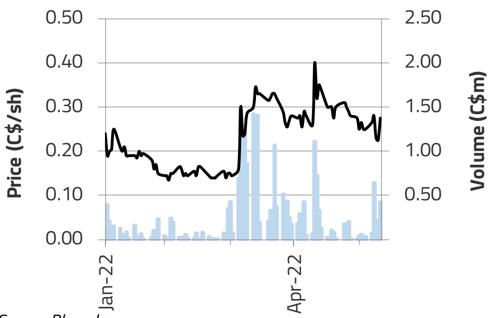
RECOMMENDATION: **BUY** *PRICE TARGET:* **C$0.50/sh** *RISK RATING:* **HIGH**

SHARE DATA	**C$0.28/sh**
Shares (basic, FD)	145 / 153
52-week high/low	0.40 / 0.14
Market cap (US$m)	US$32m
Net cash (debt) (US$m)	4
1.0xNAV7% @ US$1600/oz (US$m)	390
1.0xNAV7% FD (p/sh)	C$2.55
P/NAV (x)	0.11x
Average daily value (C$m, 3M)	0.09

FINANCIALS	**CY26E**	**CY27E**	**CY28E**
HP MSM produced (kt)	60	60	60
Revenue (C$m)	120	120	120
AISC (US$/lb)	991.6	991.6	991.6
Net Income (C$m)	8	8	9
EPS (C$/sh)	0.02	0.02	0.02
PER (x)	9.8x	9.7x	9.6x
CFPS (C$/sh)	0.07	0.07	0.07
P/CF (x)	3.0x	3.0x	3.0x
EBITDA (C$m)	12	12	12
EV/EBITDA (x)	6.3x	6.0x	5.9x

NAV over time	**2022E**	**2022E**	**2022E**
1xNAV7% FD (C$/sh)	2.29	1.92	0.95
ROI to 1xNAV (% pa)	186%	162%	50%
1.2xNAV7% FD (C$/sh)	2.75	2.30	1.14
ROI to 1.2xNAV (% pa)	213%	187%	60%

SOTP 1xNAV7% US$1600/t	**C$m**	**C$/sh**
Woodstock NPV 2Q22	453	2.96
Exploration	50	0.33
Central SG&A & fin costs 2Q22	-119	(0.78)
Net cash + options	6	0.04
TOTAL	390	2.55



Source: Bloomberg

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NB manganese carbonate to feed North American EV market

Canadian Manganese is developing the Woodstock manganese project in New Brunswick, Canada. At 43Mt at 10% Mn, Woodstock is a large and high grade mangaense carbonate project capable of supplying high purity manganese sulphate monohydrate (HP MSM) to the North American battery supply chain.

Carbonates are the green alternative to Chinese supply

Manganese is an important component of the NMC (M for Manganese) Li-ion battery chemistry. Currently 91% of supply comes from China, with an increasing share from the environmentally taxing oxide ore-calcination-electrolytic manganese metal (EMM) supply chain rather than the cleaner manganese carbonate ore – high purity manganese sulphate monohydrate (HP MSM) supply chain. The key difference is that manganese oxide requires calcining with high heat and coking coal, a highly carbon intensive reaction. Manganese carbonates are lower cost and lower emissions and we think Woodstock is the best undeveloped project.

Large open pittable resource with exploration upside

The existing resource of 43Mt at 10% Mn comes from just one deposit (Plymouth) is pit constrained and can serve as a 50-100-year asset supplying 10% plus of the global market. The licences also host the Hartford deposit (historic 90Mt MRE) and several other prospective gravity anomalies. Mineralization is entirely manganese carbonate and with consistent and low impurities, making it ideal for producing high purity MSM vs. other carbonate projects. Woodstock has higher grade and higher recovery, and has lower impurities and lower cost/carbon/energy intensity to produce battery feedstock than currently producing or development-stage oxide deposits.

In fast growing market, we like CDMN's exposure

Most forecasts have HP MSM volumes growing at 10-15% through 2030 vs 20-25% for overall battery capacity growth, thus we think optimistic demand forecasts are in fact conservative. Given the quantum of supply growth (tripling by 2030), we think it is very likely the market ends up undersupplied or reliant on high CO2 Chinese EMM sourced MSM (or both). Based on that we think exposure to CDMN to play a supply shortage is a sound thesis.

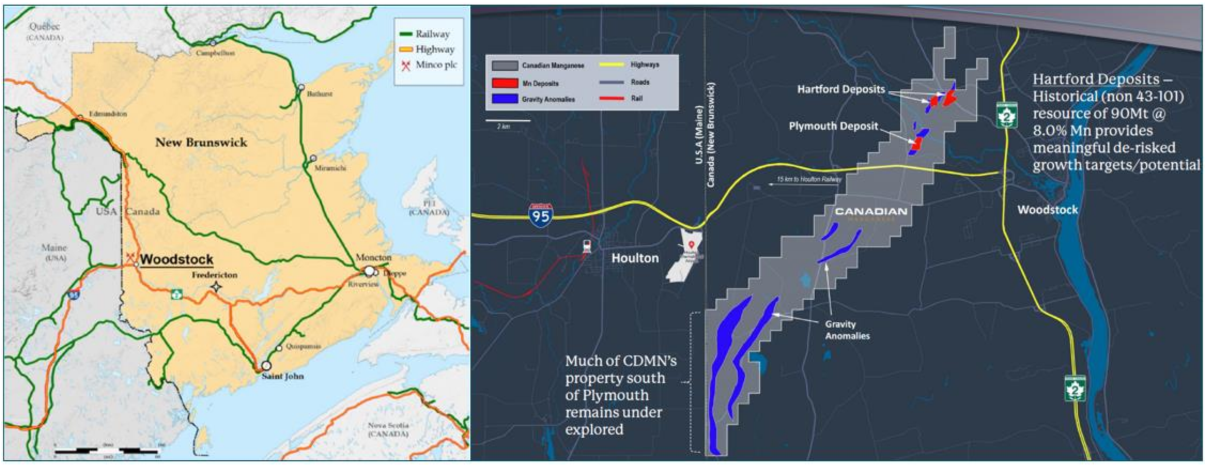
Initiate with Buy rating and C$0.50/sh PT based on 0.5xNAV$_{7\%\text{-}1600/t}$

We model an initial 700tpd operation producing 60ktpa of HP MSM with initial capital of C$325m with expansions every five years to 150ktpa of MSM from 2040. This generates an NPV$_{7\%\text{-}1600/t}$ of C$453m. We subtract C$119m for G&A and finance costs, and add C$50m for exploration. We add C$4m for cash on balance sheet and C$2m for ITM options. This results in a fully diluted but pre-funded NAV of C$530m or C$2.55/sh. We assume C$140m of equity including evaluation and build funding. With the funding but also dilution added, we generate a fully diluted NAV estimate of C$530m or C$1.00/sh.

Investment case

Canadian Manganese (CDMN) is a Canadian developer seeking to become an integrated high purity manganese sulphate monohydrate (HP MSM) supplier to the Li-ion battery industry. The company's flagship Woodstock project has a 43Mt at 10.0% Mn MRE (Plymouth deposit only) with another historical 90Mt resource at the nearby Hartford deposit and several other targets along strike. Crucially, Plymouth is a manganese carbonate deposit which means it is lower cost and lower CO2, and lower energy intensity than manganese oxide deposits, which are the majority of projects and current Mn production (which goes to the ferromanganese market). On the Plymouth deposit alone, Woodstock can supply 10-20% of the fast growing HP MSM market for 40 years and zooming out, it has the highest grade and best metallurgy on the New Brunswick manganese carbonate belt that hosts Manganese X and several other explorers. If we match the estimated lithium 10% CAGR, noting this matches industry growth forecasts, the annual market is expected to grow from ~150ktpa currently to 600ktpa by 2030.

Figure 1: Overview of Canadian Manganese

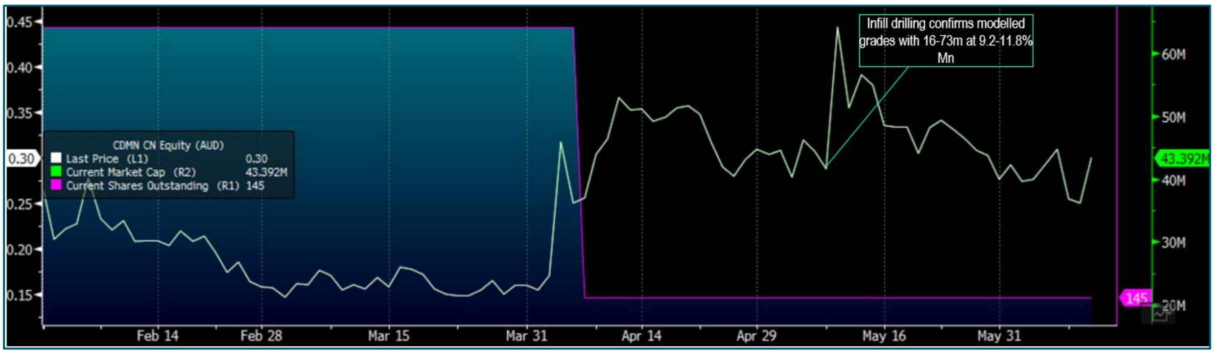


Source: Canadian Manganese

History

Canadian Manganese acquired the Woodstock project, which was previously mined for iron ore and explored for manganese since the 1970s, in 2010 they completed 7,000m of drilling in 2011-2013 to 100m spacing to support the 2014 MRE.CMDN refocused on MSM in 2020 to target the fast growing EV market. In 2021 the company did a reverse takeover of private Maximos Metals (for 59.6m shares and 9.7m options and warrants) which saw Matthew Allas, an experienced Canadian mining and finance executive, join as CEO from the same role at Maximos. Under Matt's leadership, CMDN completed 5,000m of infill in 2021 to support PFS and met work and listed on the Canadian Neo Exchange in January 2022. The overall strategy is to become a manganese sulphate supplier to the North American EV market. With infill to 50m now completed, a PFS is planned for 2023.

Figure 2: Price chart and history

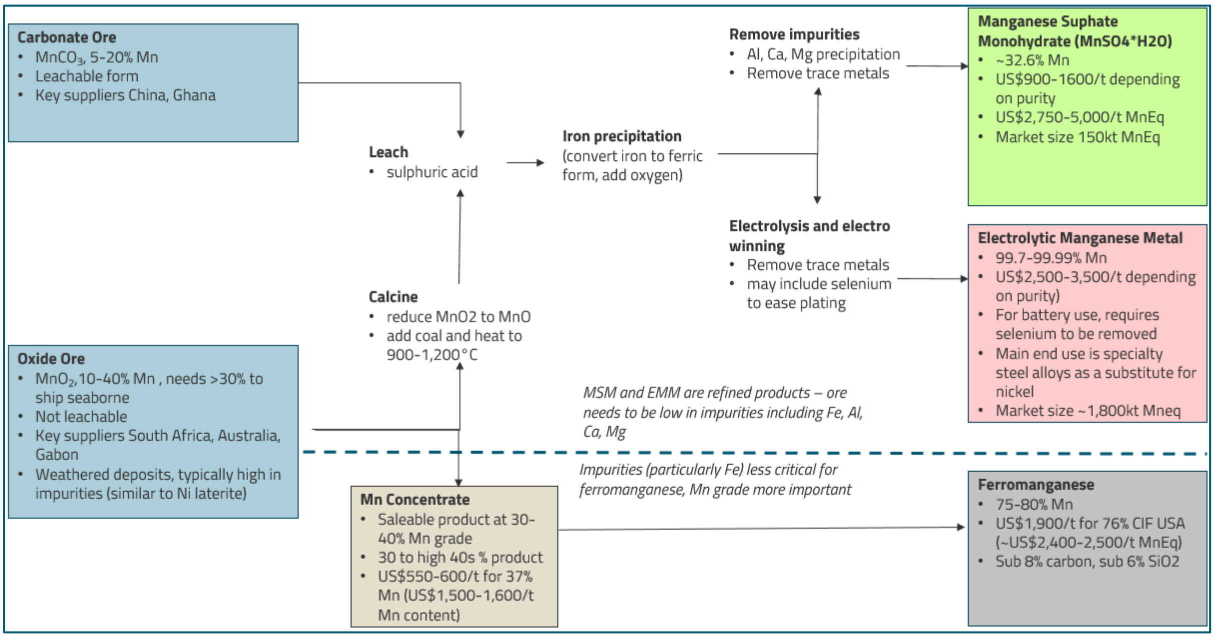


Source: Canadian Manganese, SCPe, Bloomberg market data

Manganese explained: Like Ni, high spec battery Mn sulphate product differs from large ferroalloy market

Overview: Like nickel, manganese was traditionally used to add strength to steel, with specialty higher purity products used for metal alloys (steel and aluminium) and for Li-ion battery cathodes where Mn contributes thermal stability. Ferromanganese, used as a deoxidizer for steel, accounts for 90% of manganese volumes, ~18Mt of manganese units per year, mined in oxide deposits and shipped as ore or concentrate at grades of 30% Mn or higher (as MnO_2) and processed with Fe_2O_3 in arc furnaces to make high 70s to 80% Mn ferromanganese.

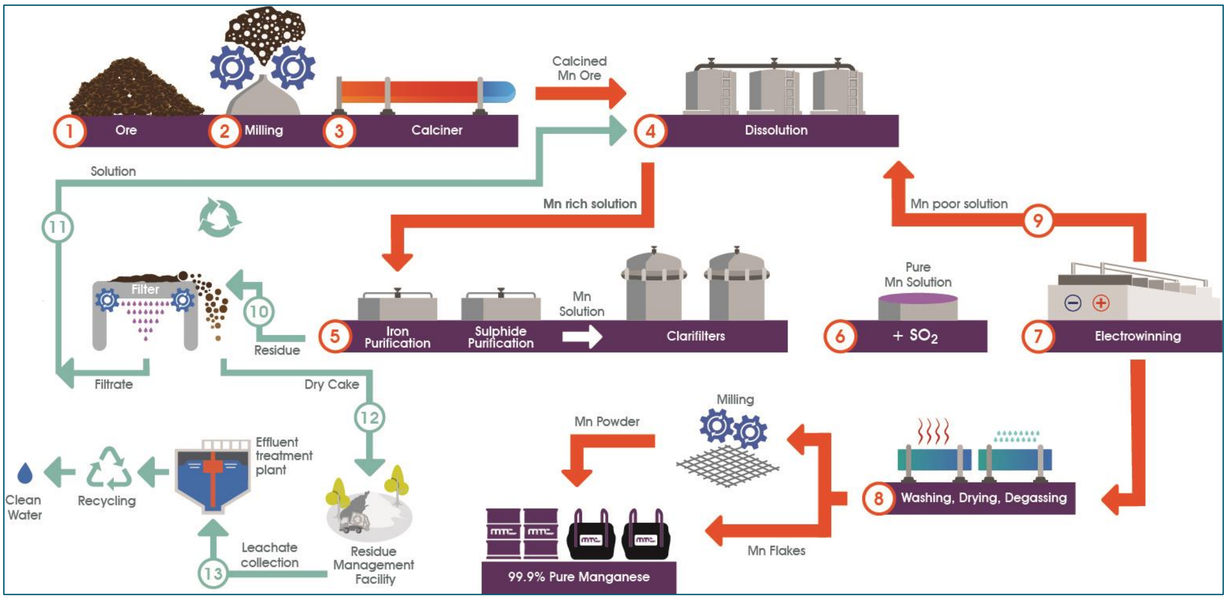
Figure 3: Manganese market overview



SCPe

Specialty and EV market: The refined specialty market includes electrolytic manganese metal (EMM, 99.7% or higher Mn content, ~1.8Mt n unit market size), and manganese sulphate monohydrate (MSM, $MnSO_4 \cdot H_2O$, 32.5% manganese, ~150kt Mn units) which is the feedstock used for Mn in NCM batteries. The lowest cost feedstocks for the refined market are manganese carbonate deposits as they are readily leachable. Alternatively, manganese oxide deposits can be calcined and then leached but this is energy and CO_2-intensive and higher cost, manganese oxides are higher in impurities than carbonates.

Figure 4: Oxide ore to EMM flowsheet

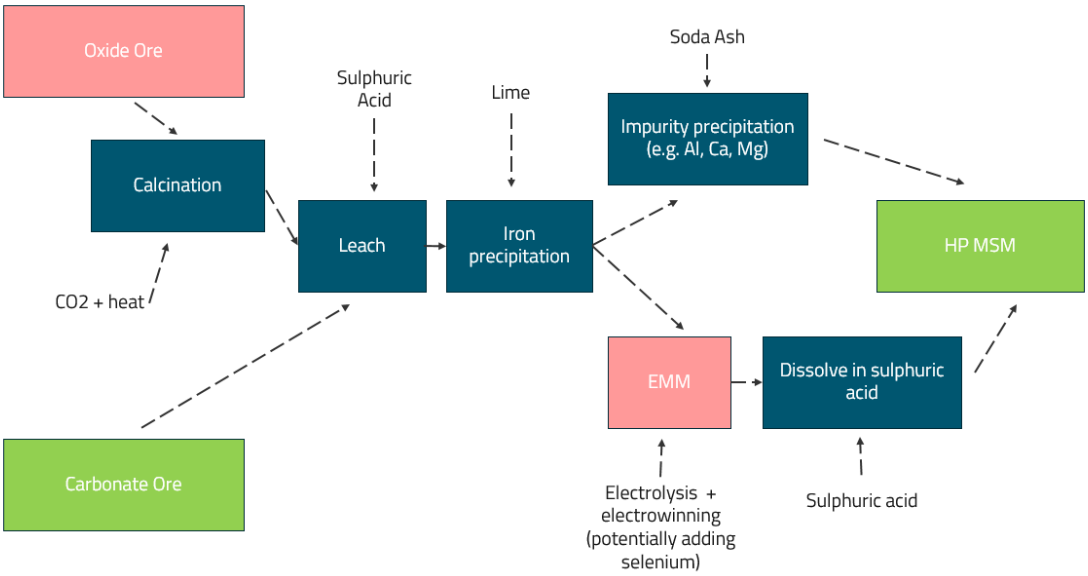


Source: The Manganese Metal Company (South Africa)

Metallurgy: Carbonates are the desired feedstock – lower impurities, lower CO2, lower cost

What we like about CDMN's Plymouth deposit is that nearly 100% of the contained manganese is carbonate (siderite), therefore amenable to leaching, and with consistent and low impurities (Ca, Mg, Al, SiO_2); these characteristics make it an ideal supplier for the high purity battery supply chain. Even in our favoured NB carbonate belt, other deposits are a mix of carbonate and oxides which means either lower leach recoveries or calcining is needed to increase recovery. The combination of leachable ore and low impurities makes Plymouth especially well-suited to feed the HP MSM market. **Carbonates vs Oxides:** Carbonates are leachable whereas magnesium oxides must be calcined to convert MnO_2 to MnO. This requires heating to 900-1200°C and reacting with coal in an energy and carbon intensive process. In addition, manganese oxides, due to being products of surface weathering, tend to be high in other impurities such as Al, Ca and Mg, which causes complications in the hydrometallurgical refinement process once they are leached.

Figure 5: Processing routes from ore to HP MSM

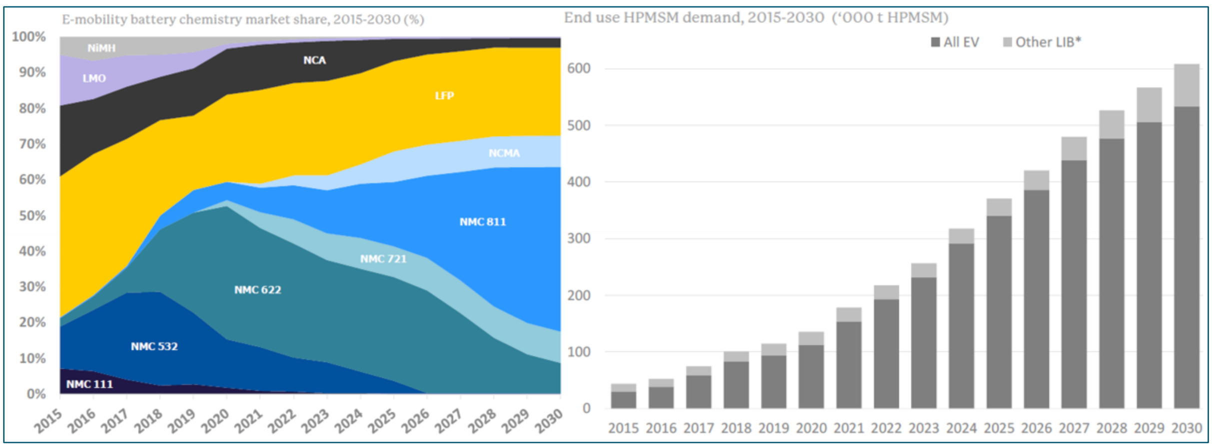


Source: SCPe

MSM market highly attractive with >10% CAGR and premium pricing to other Mn products

The HP MSM market is worth portfolio exposure for two reasons: First, while currently small at ~225t of HP MSM (~75t MnEq @ 32.5%) with another 2x in regular grade MSM, it is growing fast at a projected 13% CAGR to >600kt by 2030. Nor is this particularly aggressive in our view: GS's recent battery metals note estimated a ~20-25% EV + energy storage battery CAGR over the same period from @700GWe to ~3,500GWe. Second, like with nickel sulphides, the existing supply chain is not well suited to meet demand. While oxides can be converted to MSM via EMM this is high cost and high CO2. Enter CDMN: with a 43Mt resource, CDMN can enter the market at 10% of the MSM market and maintain market share through modular 30kt expansions every five years.

Figure 6: EV battery market share and HP MSM demand forecasts

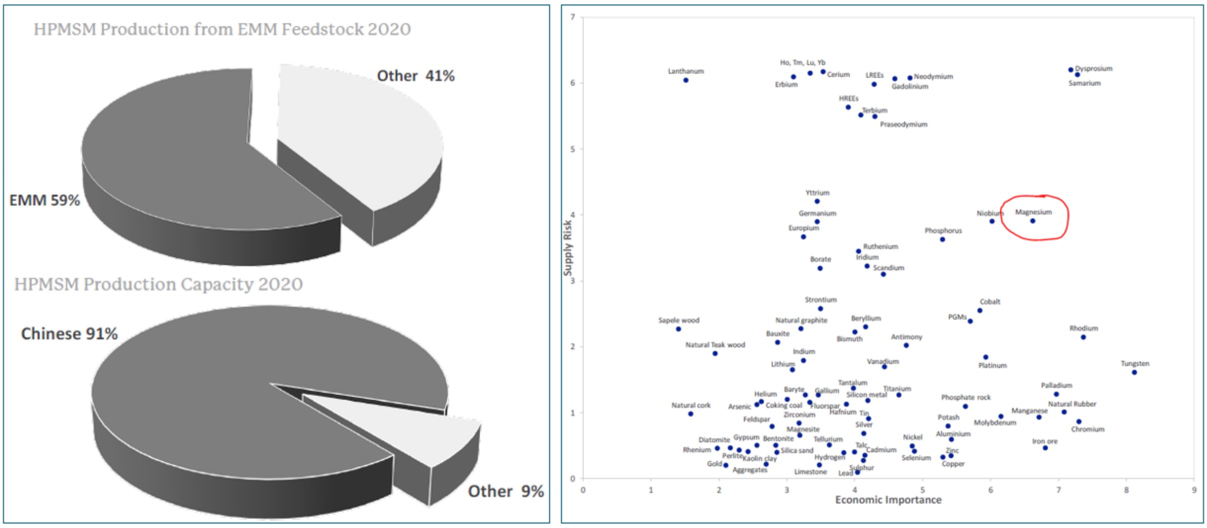


Source: CRU, Canadian Manganese

Chinese dominates supply, environmentally damaging EMM route the majority of supply

The HP MSM market is dominated by Chinese supply, which accounts for 91% of installed capacity. EMM accounts for 59% of supply; this results in higher CO2 impact due to the need for calcination (energy and CO2 intensive) and also often includes the use of pollutive selenium in the electrowinning process. Manganese has been identified by both the US Department of Energy and the European Commission as a strategically important supply risk. We believe the potential to diversify supply away from China and contribute to a more responsible and less environmentally damaging supply route is a key demand pull factor for CDMN.

Figure 7: (A) CRU estimates of China's HP MSM market share, MSM from EMM share; (B) European Commission critical materials (2020) assessment of supply risk and economic importance

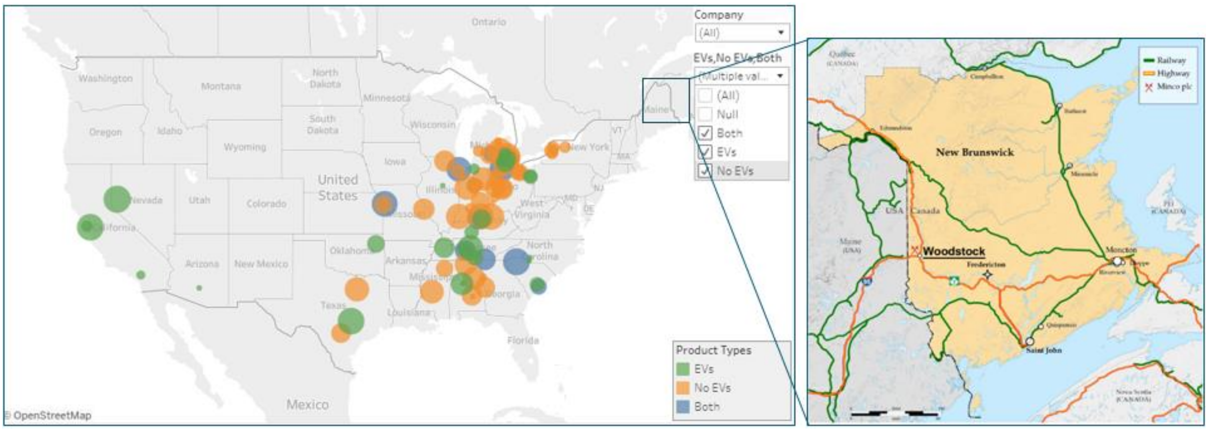


Source: CRU, Canadian Manganese, European Commission

NB carbonate deposits are a logical integration into North American EV supply chain

Woodstock is well located to integrate into the North American EV supply chain which is centred in two clusters: i) the Great Lakes region, particularly Michigan / Ohio (Ford, GM, Stellantis) and Illinois (Stellantis) and ii) the Southern US including Tennessee (Ford, GM, Nissan, VW), South Carolina (BMW, Mercedes-Benz, Volvo) and Alabama (Mercedes-Benz).Woodstock is located within 5km of the Trans-Canada Highway, which links to US I-95, with road links to the ports of Saint-John or Moncton, NB. Transport routes include by highway to the St Lawrence seaway and by ship to the Great Lakes, overland using the Interstate system, or by ship to New Orleans and barge up the Mississippi.

Figure 8: (A) US Dept of Energy and (B) EU commission assessment of critical metals



Source: Thirdway.org, Canadian Manganese

Best project in a market that will follow on a similar growth path to lithium and nickel

We think Canadian Manganese is an ideal combination of metallurgy (carbonates over oxides), location and integration into a western supply chain. It is the best project in the best belt with better metallurgy, grade and exploration upside. Noting that the Mn intensity of NCM batteries ranges from ~0.1kg/kWH for NCM 811 to 0.35kg/kWH for NCM 111 up to ~1.4kg/kWH for LMO (suitable for grid storage), we think the rapid growth of EV and grid storage applications combined with a lack of non-oxide Mn supply means that CMDN offers asymmetric risk reward, particularly at today's valuations.

Table 1: Comp table of ionic clay, ASX-listed REE developers, and relevant producers

	Carbonate deposits			Oxides		
Company	**Canadian Mn**	**Manganese X**	**Euro Mn**	**Giyani**	**Element 25**	**Firebird**
Project	**Woodstock**	Battery Hill	Chvaletice	K Hill	Butcherbird	East Pilbara
Location	**NB, Canada**	NB, Canada	Czech Republic	Botswana	W. Australia	W. Australia
Stage (last completed)	**Resource**	Resource	Pea	PEA	PFS	PEA
Resource Tonnes (mt)	**44.8**	60.8	27.0	5.2	263.0	229.8
Resource Grade (% Mn)	**9.9%**	6.7%	7.3%	17.9%	10.0%	10.5%
Ore Type	**Carbonate**	**Carbonate**	Carbonate-Tails	Oxide	Oxide	Oxide
Cut-off grade (%)	**3.5%**	2.5%	--	7.3%	7.0%	
Iron (%)	**14.2%**	10.8%	ND	ND	11.4%	8.8%
Pittable (% of resource)	**71.5%**	100.0%	100.0%	100.0%	50.6%	ND
Strip ratio (waste: ore)	**0.78**	3.70	--	2.90	0.35	ND
Minesite product(1)	**Concentrate**	Concentrate	EMM/MSM	HP MSM	Concentrate	Conc/MSM
Throughput rate (ktpa)	**1,500**	TBD	1,100	200	3,288	TBD
Pre-leach concentration	**Magnetic sep**	Flotation	Mag sep	None	Size sorter	DMS
Recovery (%)	**85.7%**	64.1%	**63.0%**	na	**94.0%**	**TBD**
Con grade (%)	**13.4%**	17.3%	**15.1%**	na	**33.1%**	**TBD**
Leach recovery (%)	**90.0%**	90.0%	**71.0%**	92-97%	**n/a**	**TBD**
Overall Recovery (%)	**77.1%**	65.0%	**59.2%**	90.7%	**n/a**	**TBD**
Acid consumption (kg/t)	**928-1256**	570	ND	260	n/a	TBD
Production (ktpa MnEq)	**SCPe 19.3**	TBD	49.1	120.0	n/a	TBD
EV (US$m)	**21**	26	60	46	44	12
EV/insitu	**0.1%**	**0.2%**	**0.8%**	**1.3%**	**0.2%**	**0.1%**
EV + capex/insitu	**2%**	**na**	**6%**	**5%**	**0%**	**na**
Risks evaluation						
Calcination required	**No**	**No**	**No**	Likely (1)	Yes	Yes
Selenium	**No**	**No**	No	Optional	Optional	Optional
Downstream product	**HP MSM**	**HP MSM**	**HP MSM/EMM**	EMM/MSM	Ferro Mn	HP MSM
Capex (US$m)	**SCPe 250**	TBD	404	134	17	TBD
Infrastructure - SCPe	**Moderate**	Moderate	High	Moderate	Remote AUS	Remote AUS
Royalty	**2.0%**	2.0%	2.7%	3.0%	5.0%	5.0%
Permit risk - SCPe	**Canada**	**Canada**	Europe	Botswana	W Australia	W Australia

Source: SCPe, Factset, Company disclosure; (1) Company says majority of mineralization is MnO which is soluble. Our experience is most oxide deposits contain a majority of MnO2 which requires calcining

Valuation

We value Canadian Manganese using a discounted cash flow methodology. We model C$325m of initial capital with first production in 2026 starting at 60ktpa of HP MSM (625tpd throughput) at 1.3x strip ratio and 10% head grade, with 3x 30ktpa of HP MSM capacity expansions thereafter every five years for C$50m capex with ultimate capacity of 150ktpa of HP MSM from 2040 onwards, and a total 60-year mine life modelled. This generates an NPV$_{7\%\text{-}1600/t}$ of C$453m. We subtract C$119m for G&A and finance costs, and add C$50m for exploration. We add C$4m for cash on balance sheet and C$2m for ITM options. This results in a fully diluted but pre-funded NAV of C$530m or C$2.55/sh. We assume C$140m of equity including evaluation and build funding. With the funding but also dilution added, we generate a fully diluted NAV estimate of C$530m or C$1.00/sh.

Figure 9: SCPe Valuation build-up

Group-level SOTP valuation				
	C$m	O/ship	NAVx	C$/sh
Woodstock NPV 2Q22	452.5	100%	1.0x	2.96
Central SG&A & fin costs 2Q22	(118.8)	--	1.0x	(0.78)
Exploration	50.0	--	1.0x	0.33
Other assets	--	--	1.0x	--
Cash and restr. cash 1Q22	4.3	--	1.0x	0.03
Debt 1Q22	--	--	1.0x	--
ITM options	1.6	--	1.0x	0.01
1xNAV7% US$1600/lb	**390**			**2.55**
Assumed build equity issuance	140.0			0.26
1xNAV fully funded7% US$1600/lb	**530**			**1.00**
P/NAV - fully diluted for build (x)				**0.28x**
Target multiples	**Multiple**			**C$/sh**
Target P/NAV Multiple	**0.50x**			**0.50**
Target price				**0.50**

Commodity price	CY24E	CY25E	CY26E	CY27E	CY28E
HP MSM price (US$/t)	1,600	1,600	1,600	1,600	1,600
	CY24E	**CY25E**	**CY26E**	**CY27E**	**CY28E**
FD shares out (m)	354.5	526.9	530.8	532.1	532.1

1xNAV sensitivity to gold price and discount / NAV multiple					
1xNAV Woodstock (C$m)	$1200/t	$1400/t	$1600/t	$1800/t	$2000/t
10% discount	-108	27	162	296	431
9% discount	-80	77	234	391	549
8% discount	-43	143	329	514	700
7% discount	8	230	**453**	675	897
6% discount	77	348	619	889	1,160
5% discount	173	509	845	1,181	1,517

Source: SCPe

Initiate with BUY rating and C$0.50/sh price target based on 0.5x NAVPS$_{7\%}$

We initiate with a BUY rating and C$0.50/sh price target based on 0.5x fully funded NAV$_{7\%}$ using a LT prices of US$1,600/t for HP MSM. While our valuation is DCF driven, the thesis here is the macro. In our view Canadian Manganese is the best suited manganese project to supply the HP MSM market to feed into the EV and stationary battery supply chain. Given the growth rates projected, which are already more conservative than the overall battery capacity growth rate, and the lack of manganese carbonate projects available, we think it is likely that the market will be undersupplied and as the lowest cost and lowest carbon project available, CDMN will be in high demand by investors and battery producers. At the current entry price, we like the risk-reward opportunity here.

Catalysts

- 2022: Infill drilling to support updated MRE and maiden reserve
- 2023: SCPe PFS and hydromet venue selection and permitting commencement
- 2024: DFS, permitting, construction start
- 2026: SCPe first production

Why we like Canadian Manganese

- Leachable and low impurities lead to lowest cost and CO2 for manganese sulphate
- Long life resource can supply 10% of market for multiple decades
- Location on NB/Maine border well situated to integrate into North American EV supply chain

Ticker:	CDMN CN	Price / mkt cap:	C$0.28/sh, C$41m	Market P/NAV:	0.11x	Assets:	Woodstock
J Chan / B Gaspar / E Magdzinski		Rec / PT:	BUY / C$0.50	1xNAV$_{2020}$ FD:	C$2.55/sh	Country:	Canada (NB)

Group-level SOTP valuation	1Q22	2Q22			
		C$m	O/ship	NAVx	C$/sh
Woodstock NPV 2Q22		452.5	100%	1.0x	2.96
Central SG&A & fin costs 2Q22		(118.8)	--	1.0x	(0.78)
Exploration		50.0	--	1.0x	0.33
Other assets		--	--	1.0x	--
Cash and restr. cash 1Q22		4.3	--	1.0x	0.03
Debt 1Q22		--	--	1.0x	--
ITM options		1.6	--	1.0x	0.01
1xNAV7% US$1600/lb		**390**			**2.55**
Assumed build equity issuance		140.0			0.26
1xNAV fully funded7% US$1600/lb		**530**			**1.00**
P/NAV - fully diluted for build (x)					**0.28x**
Target multiples		**Multiple**			**C$/sh**
Target P/NAV Multiple		**0.50x**			**0.50**
Target price					**0.50**

Sources		Uses	
SCPe capex	C$325m	Current cash + ITM options	C$4m
SCPe contingency	C$32m	Mine debt @ 60% gearing	C$250m
SCPe G&A + fin. cost to first Au	C$24m	Build Equity	C$140m
SCPe working capital	C$13m	Offtake	C$0m
Total uses	C$394m	Total proceeds	C$394m

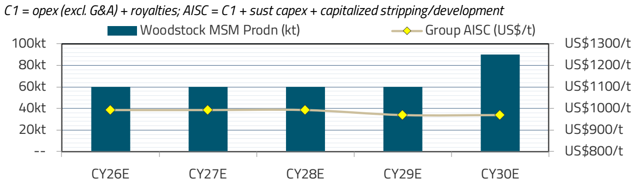
1xNAV sensitivity to gold price and discount / NAV multiple					
1xNAV Woodstock (C$m)	$1200/t	$1400/t	$1600/t	$1800/t	$2000/t
9% discount	-80	77	234	391	549
8% discount	-43	143	329	514	700
7% discount	8	230	**453**	675	897
6% discount	77	348	619	889	1,160
5% discount	173	509	845	1,181	1,517
5% discount	173	509	845	1,181	1,517
Valuation (C$/sh)	$1200/t	$1400/t	$1600/t	$1800/t	$2000/t
0.10xNAV	-	-	0.10	0.20	0.30
0.25xNAV	0.05	0.05	0.25	0.50	0.80
0.50xNAV	0.05	0.10	**0.50**	1.05	1.60
0.75xNAV	0.10	0.10	0.75	1.55	2.40
1.0xNAV	0.10	0.15	1.00	2.05	3.20

Valuation over time	1Q22E	1Q23E	1Q24E	1Q25E	1Q26E
Mines NPV (US$m)	437	472	511	731	956
Cntrl G&A & fin costs (US$m)	-116	-122	-130	-132	-127
Net cash at 1Q (US$m)	10	3	-45	-221	-204
Other Assets + Options	2	2	2	2	2
1xNAV (US$m)	332	355	338	380	627
P/NAV (x):	0.12	0.15	0.29	0.39	0.24
1xNAV share px FD (C$/sh)	2.29	1.92	0.95	0.72	1.18
ROI to equity holder (% pa)	*186%*	*162%*	*50%*	*27%*	*33%*
1.2xNAV share px FD (C$/sh)	2.75	2.30	1.14	0.87	1.42
ROI to equity holder (% pa)	*213%*	*187%*	*60%*	*33%*	*38%*

Resource / Reserve	Mt	% Mn	Contained	EV/t Mn	EV/t MSM
Measured, ind. & inf. - Woodstock	43,070	10.0%	4,307	6.8	21
SCPe Mine inventory - Woodstock	35,135	10.0%	3,513	8.4	26

Production (100%)	CY26E	CY27E	CY28E	CY29E	CY30E
Woodstock MSM (t HP MSM)	60.0	60.0	60.0	60.0	90.0
Woodstock cash cost (US$/t)	$846	$846	$846	$846	$846
Woodstock AISC (US$/t)	$992	$992	$992	$969	$969

C1 = opex (excl. G&A) + royalties; AISC = C1 + sust capex + capitalized stripping/development

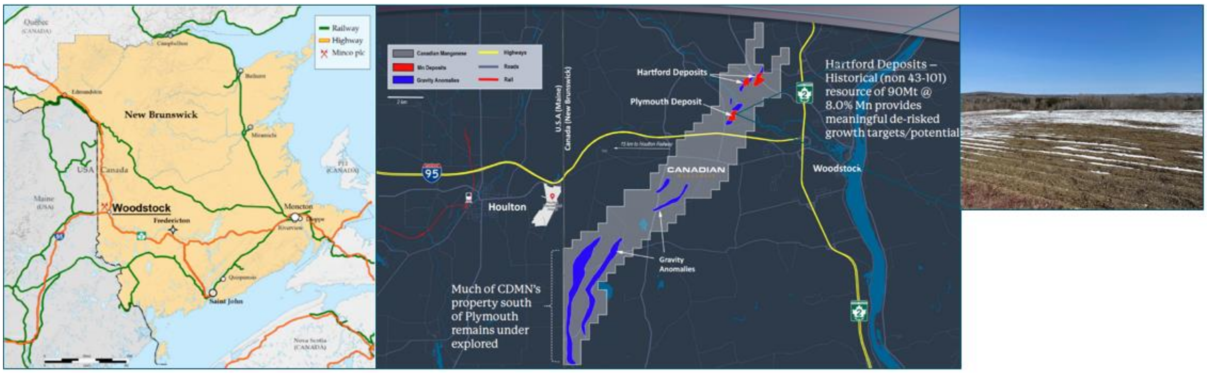


Share data					
Basic shares (m): 144.7	FD + options (m):		152.6	FD + FF	532.1
Commodity price	**CY24E**	**CY25E**	**CY26E**	**CY27E**	**CY28E**
HP MSM price (US$/t)	1,600.0	1,600.0	1,600.0	1,600.0	1,600.0
Ratio analysis	***CY24E***	**CY25E**	**CY26E**	**CY27E**	**CY28E**
FD shares out (m)	354.5	526.9	530.8	532.1	532.1
EPS (C$/sh)	(0.016)	(0.026)	0.023	0.023	0.023
CFPS before w/c (C$/sh)	(0.00)	(0.00)	0.07	0.07	0.07
FCFPS pre growth (C$/sh)	(0.02)	(0.03)	0.03	0.03	0.03
FCF/sh (C$/sh)	(0.49)	(0.31)	0.06	0.06	0.06
FCF yield - pre growth (%)	neg	neg	13.2%	13.3%	13.5%
FCF yield (%)	neg	neg	27.9%	28.0%	28.1%
EBITDA margin (%)	--	--	43.0%	43.0%	43.0%
FCF margin (%)	27.7%	27.8%	28.0%	(13.7%)	29.0%
ROA (%)	(2.1%)	(3.6%)	3.0%	3.0%	2.9%
ROE (%)	(4.0%)	(10.3%)	8.2%	7.7%	7.2%
ROIC (%)	(0.8%)	(0.4%)	11.9%	12.1%	11.7%
EV (C$m)	125	339	323	308	305
PER (x)	(13.6x)	(8.5x)	9.8x	9.7x	9.6x
P/CF (x)	(54.1x)	(168.1x)	3.0x	3.0x	3.0x
P/Book value (x)	0.5x	0.9x	0.8x	0.7x	0.7x
EV/EBITDA (x)	(83.1x)	(225.8x)	6.3x	6.0x	5.9x
Income statement	**CY24E**	**CY25E**	**CY26E**	**CY27E**	**CY28E**
Revenue (C$m)	--	--	120	120	120
COGS (C$m)	--	--	(63)	(63)	(63)
Gross profit (C$m)	**--**	**--**	**57**	**57**	**57**
Expenses (C$m)	(2)	(2)	(2)	(2)	(2)
Impairment & other (C$m)	--	--	--	--	--
Net finance costs (C$m)	(17)	(30)	(34)	(34)	(34)
Tax (C$m)	--	--	(13)	(13)	(13)
Minority interest (C$m)	--	--	--	--	--
Net income attr. (C$m)	**(18)**	**(31)**	**8**	**8**	**9**
EBITDA	*(6)*	*(14)*	*12*	*12*	*12*
Cash flow	**CY24E**	**CY25E**	**CY26E**	**CY27E**	**CY28E**
Profit/(loss) after tax (C$m)	(6)	(14)	12	12	12
Add non-cash items (C$m)	4	13	27	27	27
Less wkg cap / other (C$m)	--	--	--	--	(13)
Cash flow ops (C$m)	**(1)**	**(1)**	**39**	**39**	**26**
PP&E (C$m)	(163)	(163)	(6)	(6)	(6)
Other (C$m)	--	--	--	--	--
Cash flow inv. (C$m)	**(173)**	**(163)**	**(6)**	**(6)**	**(6)**
Debt draw (repayment) (C$m)	250	125	--	--	--
Equity issuance (C$m)	130	1	1	--	--
Other (C$m)	(129)	(13)	(18)	(18)	(18)
Cash flow fin. (C$m)	**251**	**113**	**(17)**	**(18)**	**(18)**
Net change post forex (C$m)	77	(50)	16	16	3
FCF (C$m)	*(174)*	*(163)*	*33*	*33*	*34*
Balance sheet	**CY24E**	**CY25E**	**CY26E**	**CY27E**	**CY28E**
Cash (C$m)	80	29	46	62	64
Accounts receivable (C$m)	0	0	0	0	5
Inventories (C$m)	--	--	--	--	16
PPE & exploration (C$m)	194	356	353	349	346
Other (C$m)	--	--	--	--	--
Total assets (C$m)	**274**	**386**	**399**	**411**	**430**
Debt (C$m)	125	250	250	250	250
Other liabilities (C$m)	1	1	1	1	8
Shareholders equity (C$m)	167	168	169	169	169
Retained earnings (C$m)	(24)	(37)	(25)	(13)	(1)
Minority int. & other (C$m)	4	4	4	4	4
Liabilities+equity (C$m)	**274**	**386**	**399**	**411**	**430**
Net cash (C$m)	*(45)*	*(221)*	*(204)*	*(188)*	*(186)*
Net Debt to NTM EBITDA (x)	*nmf*	*4*	*4*	*4*	*4*

Woodstock, New Brunswick, Canada (100% owned)

The Woodstock Project is located in western New Brunswick, Canada, 4km west of the town of Woodstock (pop 5.2k) and 100m north of the town of Fredericton (pop 58k). The tenements go up to the Maine-New Brunswick border that forms the national border between the USA and Canada. Canada Highway 2 crosses the licence area and the license is well served by air and land transportation with population centres within daily commute distance. The main employers in the region are agriculture and forestry. The project has access to grid power, extensive local drainage for fresh water, and with rail access within 15km at Houlton, Maine.

Figure 10: Location map and surrounding infrastructure



Source: Canadian Manganese

History: Iron ore was mined in the area in the 1800s. Manganese potential was discovered by Government mapping work in the 1930s and Government and university exploration work from the 1930s through 1980s, with met work conducted in the 1980s investigating potential to produce EMM. In 2010 the project was purchased by Buchans Minerals Corporation which conducted 5,000m of drilling in 2011 and 2013 on 100m spacing to define a maiden resource in 2013 and updated resource in 2014 to support a PEA which contemplated 1,500tpd and 3,000tpd EMM production options.

Geology: Manganese carbonate in a district scale belt

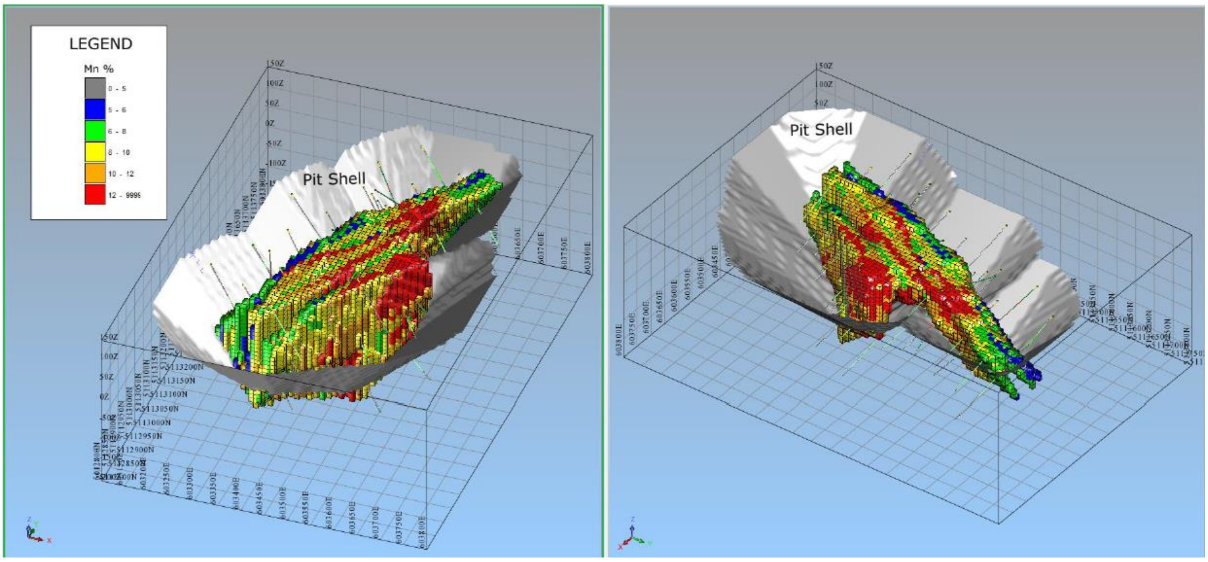
Figure 11:Woodstock November 2021 MRE – base case 5% Mn cut-off

Type	Cut-off	Category	Tonnes	Mn (%)	Fe (%)
Pit-Constrained	**5%**	**Inferred**	**43.07**	**10.01%**	**14.32%**
Pit-Constrained	6%	Inferred	41.12	10.22%	14.57%
Pit-Constrained	7%	Inferred	37.95	10.53%	14.92%
Pit-Constrained	8%	Inferred	33.56	10.93%	15.36%
Pit-Constrained	9%	Inferred	28.64	11.34%	15.83%
Pit-Constrained	10%	Inferred	22.33	11.86%	16.42%

Source: Canadian Manganese, as at Nov 2021, optimised at US$1,500/t HP MSM and US$965/t MSM, mining cost C$6.50/t and processing C$193/t at 1,000tpd

Resource: The current 43Mt at 10.0% Mn inferred resource is based on a single pit, the Plymouth deposit, which has been drilled over 700m of strike with a maximum width of 200m. The resource is presented at a 5% Mn cut-off and pit shell constrained. The current resource is drilled at a spacing of 100m and will be infilled to 50m spacing to support indicated resources and a maiden reserve to support the PFS. The resource remains open along strike and down dip and there are numerous other Mn-Fe occurrences that have not been drilled. In addition, the Hartford deposits, located 3km to the north, have a historic resource of 90Mt at 8.0% Mn, indicating there is significant low-hanging upside potential.

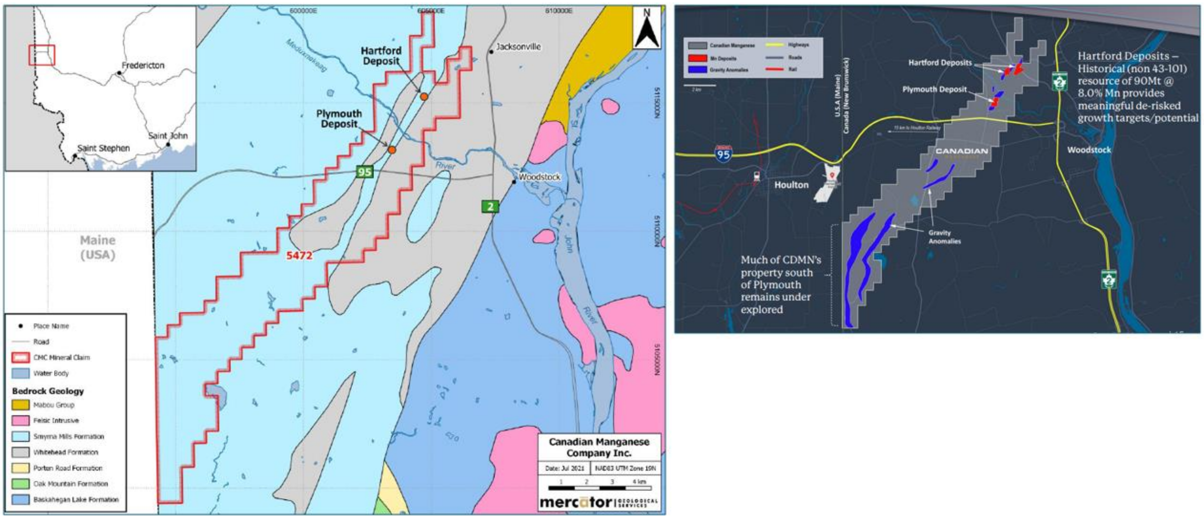
Figure 12: Resource block model at a 5% Cut-off grade



Source: Canadian Manganese

Geology and upside: The property is underlain by Ordovician and Silurian sediments (siltstones and slates). The Woodstock iron-manganese deposits are interpreted as Early Silurian Mn-rich banded iron formations that formed large lenticular bodies within the Silurian sediments (non-calcareous silty shales) of the Smyrna Hills formation in a shallow marine basic during orogeny and in sharp contact with red and green shales. The Plymouth deposit is an assemblage of iron and manganese oxide and carbonate-silicate-oxide rocks formed within a shallow marine basin. Manganese mineralization in both the red and grey siltstones is dominated by manganese carbonate in the form of rhodochrosite; this is beneficial for metallurgy over manganese oxides. The rhodochrosite occurs in both oxide (hematite, magnetite and ilmenite) and carbonate (siderite) minerals). The deposits occur in stratiform bodies and this style ends to form multiple pods along strike suggesting potential for multiple deposits along strike to the SW, which is supported by the existence of gravity anomalies.

Figure 13: Regional geology and location of Plymouth and Hartford deposits



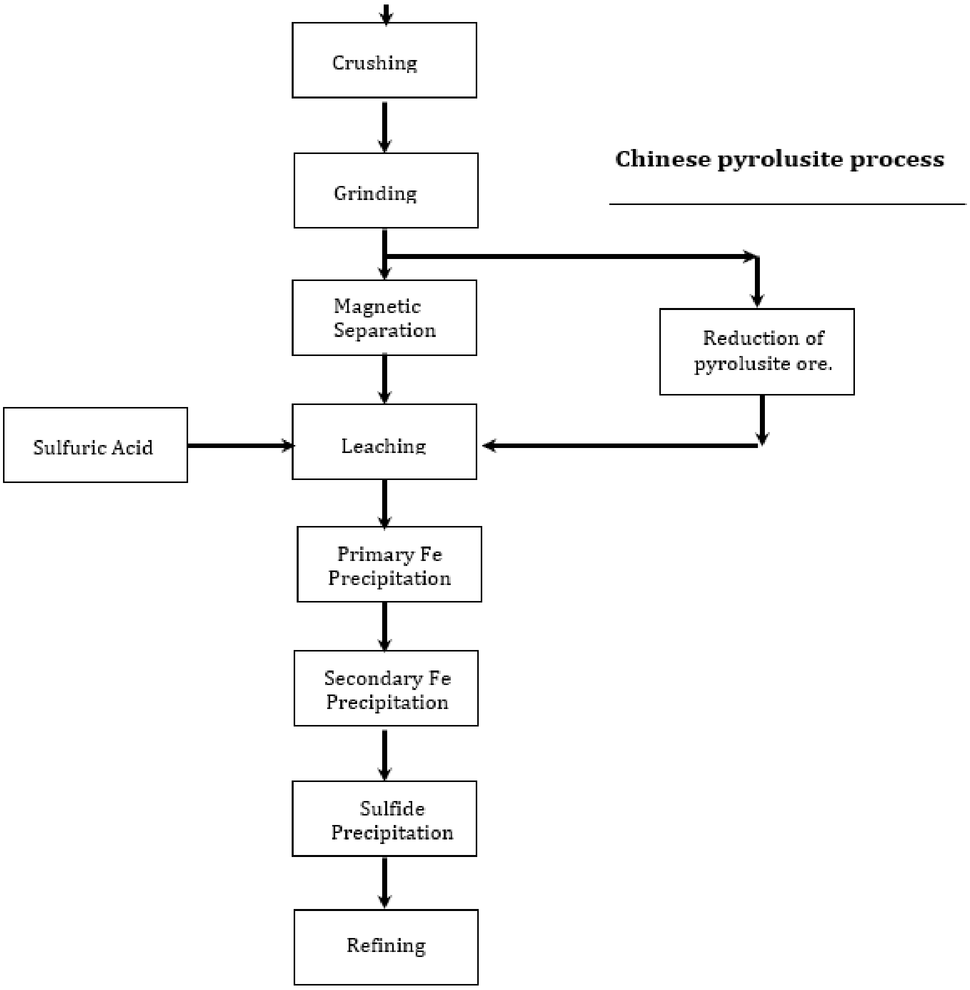
Source: Canadian Manganese, SCPe

Mining and processing

Mining: The deposit is low strip and outcrops in some areas with the highest grades near surface. The 2014 PFS included a 32Mt at 10.1% Mn mine inventory at 0.78x strip ratio at 1,500tpd over 20-years or a larger 41Mt at 9.9% Mn at 1.34x strip ratio at 3,000tpd over 13-years. The larger mine plan featured 56t trucks vs 38t trucks used in the smaller scenario. We assume a 700tpd (250ktpa) operation ramping up to 1,700tpd through progressive expansion, for overall 35Mt inventory at 10% Mn grade and a 1.4x strip. This is quite conservative relative to the prior PEA strip ratio and can be beaten. We foresee a standard open pit, contractor mining operation.

Processing: We expect the flowsheet to include comminution and magnetic separation at the mine site to produce a ~15% concentrate. As the deposit is a manganese carbonate and nearly all of manganese contained is truly a carbonate (rather than a mix of oxide), mineralization should be amenable to sulphuric acid leaching. This may take place at the mine site but more likely another processing site that is some combination of permitted or with short permitting time, with cheap electricity and near to end customers. We expect concentrate to be shipped to the downstream site for leaching using sulphuric acid and then either electrowinning to EMM or further processing to reduce Mg and Ca before precipitation into HP MSM. We think it is more likely that hydromet will be performed at a separate facility located at a location that optimizes access to reagents (especially sulphuric acid), permit times, financial incentives, and customer preferences. This could include sites in Quebec (cheap power) or the US (acid availability, moderate power cost, financial / permitting incentives, and near end users).

Figure 14: Conceptual manganese carbonate flowsheet



Source: Canadian Manganese

EMM vs MSM: The input product for NCM batteries is high purity manganese sulphate monohydrate (HP MSM). This is produced either through i) direct precipitation from manganese in solution or by ii) first producing EMM from solution and then dissolving EMM in sulphuric acid to produce HP MSM. The EMM route is more acid intensive and expensive but is often used especially from oxide ores because the EMM process, using electrolysis, more easily avoids certain impurities (Al, Ca, Mg) which don't plate during electrowinning. The direct MSM route requires soda ash and other additives to precipitate impurities from solution and may be more expensive if there are high impurities. The EMM route, especially in China, often also includes the use of selenium (poisonous) which results in faster plating of Mn during electrowinning, however this has environmental consequences as well.

Economics

SCP modelled scenario: The below are SCPe assumptions, noting that Canadian Manganese is currently undertaking study work on resource/reserve definition, product selection and determining location of downstream processing. They are not to be taken as guidance from management. The 2014 PEA completed by a prior operator is not to be relied upon either.

Figure 15 SCP estimates summary

					4 yrs at 60ktpa HP MSM				5 yrs at 90ktpa		5 yrs at 120ktpa		2040-2086 at 150ktpa		
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2034	2035	2039	2040	2041	LOM
Tonnes Mined (kt)	--	--	--	--	253	253	253	253	379	379	506	506	632	632	35,135
Grade (% Mn)	--	--	--	--	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Strip ratio (waste: ore)	--	--	--	--	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Mag sep Recovery (%)	--	--	--	--	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%	86%
Conc produced (kt)	--	--	--	--	135	135	135	135	203	203	271	271	338	338	18,819
Mn contained (kt)	--	--	--	--	22	22	22	22	33	33	43	43	54	54	3,011
Hydromet recovery (%)	--	--	--	--	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	5,490%
HP MSM produced @ 32.5% Mn (kt)	--	--	--	--	60	60	60	60	90	90	120	120	150	150	8,337
Revenue (US$/t)	--	--	--	--	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Cash cost (C$/t)	--	--	--	--	991	991	991	991	991	991	991	991	991	991	1,238
AISC (C$/t)	--	--	--	--	1,156	1,156	1,156	1,156	1,156	1,156	1,156	1,156	1,156	1,156	1,445
Growth capex (C$m)	5	5	173	163	--	--	--	50	--	50	--	50	--	--	533
Sustaining Capex (C$m)	--	--	--	--	6	6	6	6	9	9	12	12	15	15	826
Revenue (C$m)	--	--	--	--	120	120	120	120	180	180	240	240	300	300	16,673
Op costs (C$m)	--	--	--	--	-59	-59	-59	-59	-89	-89	-119	-119	-149	-149	-8,258
EBITDA (C$m)	--	--	--	--	57	57	57	57	85	85	113	113	141	141	7,860
FCF (C$m)	**-5**	**-5**	**-173**	**-163**	**38**	**38**	**38**	**-12**	**57**	**7**	**76**	**26**	**95**	**95**	**4,738**

Source: SCPe

Inventory: We model a total LOM inventory of 35.1Mt at 10%. The existing inferred resource of 43Mt is already pit constrained and our lower modelled inventory reflects limited value addition beyond our modelled 60-year horizon rather than a specific factor constraining resource to reserve conversion.

Ops: We model a 24-month construction period from 2024 (calendar year) to 2026 with first production in 2026 initially at a 700tpd (~250ktpa) run rate. We model a flat LOM average 10% Mn head grade though we expect there to be potential for higher grades in early years noting that the high grade zones outcrop. We model a 60-year mine life producing an average of 135tpa of high purity manganese sulphate (44ktpa Mn) peaking at 150ktpa from 2041.

We model an open pit mining operation at 1.4 strip ratio producing 253ktpa of ore and 550ktpa of material movement in stage one, ramping up to 1.4Mtpa of material movement from 2041 to the end of the mine life. We estimate OP mining costs of C$6.50/t in line with the resource estimation assumptions. We think this is a conservative figure that could be beaten. We model a magnetic separation on site with a 50% mass pull and 95% recovery producing a ~16% Mn concentrate, and 90% recovery through the leaching process with overall processing costs of C$40/t at mine site and US$235/t of concentrate leached plus US$100/t of concentrate transport costs.

Capex: We model initial capex of C$325m for initial 60ktpa of HP MSM followed by three C$50m, 30ktpa expansions for ultimate capacity of 150ktpa from 2042.

Margins and economics: We estimate average annual revenue of C$120-300m over the LOM with annual opex of C$60m at 60ktpa (increasing proportionately to C$150m at 150ktpa), 3.3% royalties (C$67/t of HP MSM) generating healthy LOM EBITDA margins of 47% and average annual C$84m FCF per year. This generates an $NPV_{7\%}$ of C$452m and IRR of 35% with FCF payback in year ten (due to the expansions). While we model the expansions funded from cash flow, we think there is significant re-rating potential once CDMN reaches steady state production annual FCF of C$40m at stage I production should translate to a C$500-1,000m market cap to support debt refinance and capex for the expansion.

Sensitivities: We analyse project NPV sensitivity to various inputs including HP MSM price, unit costs, magnetic separation recovery / conc grade and payability / hydromet recovery. The most sensitive inputs are price, concentrate grade and hydromet recovery. The NPV is less sensitive to unit costs and capex than operating parameters such as concentrate grade and hydromet recovery. This highlights that metallurgy and ability to achieve high purity product (therefore payability/price) are the key drivers of economics and we believe that Woodstock has a material advantage in this regard for reasons already discussed.

Figure 16: Sensitivity summary

Woodstock NPV7% (C$m)	HP MSM: US$1,400/t	US$1,500/t	US$1,600/t	US$1,700/t	US$1,800/t
DR: 5.0%	509	677	845	1,013	1,181
DR: 6.0%	348	483	619	754	889
DR: 7.0%	230	341	**453**	564	675
DR: 8.0%	143	236	329	421	514
DR: 9.0%	77	156	234	313	391

Woodstock NPV7% (C$m)	Op costs: -10.0%	-5.0%	flat	+5.0%	+10.0%
Capex: -10.0%	580	537	494	452	410
-5.0%	559	516	473	431	389
flat	538	495	**453**	410	368
+10.0%	496	453	411	368	327
+20.0%	455	411	369	327	285

Woodstock NPV7% (C$m)	Conc grade: 14.0%	15.0%	16.0%	17.0%	18.0%
Magsep Recovery: 80.0%	282	338	386	429	467
82.5%	308	365	415	459	499
85.7%	341	401	**453**	498	539
87.5%	360	420	474	520	562
90.0%	386	448	503	551	594

Woodstock NPV7% (C$m)	Payability: 90.0%	95.0%	100.0%	105.0%	110.0%
Hydromet Recovery: 80.0%	97	176	255	334	413
85.0%	186	270	354	438	522
90.0%	275	364	**453**	541	630
95.0%	364	457	551	645	739
100.0%	453	551	650	749	848

Source: SCPe

Government and stakeholders:

Project Ownership: Woodstock is 100% owned by CDMN in through mineral claim 5472 totalling 58.75km^2.

Royalties and Tax: The profit tax rate in New Brunswick is 27% including federal and provincial tax. The applicable royalty rate is 2.0% in New Brunswick though there is a 2-year exemption for new mine.

Permitting: Lead responsibility for the mine permitting process will fall on the province of New Brunswick. CDMN has acquired surface title ownership to a large percentage of the land overlying the Plymouth Deposit and has entered into access agreements to carry out land not owned. The key documents include flora and fauna, aquatic and watershed baseline studies, as part of the environmental assessment (EA) process. In Canada, the Provincial EA is typically the most comprehensive permitting document while key considerations include First Nations support, watershed and wildlife impact. We don't see any undue risks as far as this is concerned.

Corporate and Financial Summary

Share structure: CDMN has 144.7m shares outstanding with 7.9 options and warrants at a weighted average exercise price of C$0.20/sh. We assume a total of C$140m to fund exploration, project evaluation, and the equity portion of Woodstock project construction. We base our per share valuation on a fully-diluted, fully-funded assumed share count of 537m fully diluted, fully funded shares outstanding.

Funding assumptions: As the end of March 2022, CDMN had C$4.3m of cash and no debt. Funding for Woodstock: We estimate C$325m of build capex, $15m of evaluation costs, C$15m of G&A, and C$15m of working capital to positive cash flow, creating a total external funding requirement of C$370m. We assume the asset is financed through C$250m of debt at a 7% cost of capital, and C$140m of equity between earlier funding for evaluation and mine build equity funding.

Financials: We forecast steady state EBITDA margins of 45% over our modelled operating horizon including 47% mat mine level. We estimate LOM average FCF per year of C$99m, rising from C$39m in early years at stage I to C$90m at SCPe stage IV (150ktpa). Returns on capital are attractive at 10-30% ROIC and 10-20% ROCE in the first 20 years.

Figure 17: SCPe cash flow and balance sheet estimates

					4 yrs at 60ktpa HP MSM				5 yrs at 90ktpa		5 yrs at 120ktpa		2040-2086 at 150ktpa	
	2022	2023	2024	2025	2026	2027	2028	2029	2030	2034	2035	2039	2040	2041
Revenue (C$m)	--	--	--	--	120	120	120	120	180	180	240	240	300	300
EBITDA ($m)	-2	-2	-2	-2	52	52	52	52	80	80	108	108	136	136
Net income (C$m)	-1	-1	-6	-14	12	12	12	12	35	40	58	63	81	82
EPS (C$/sh)	-0.01	-0.01	-0.02	-0.03	0.02	0.02	0.02	0.02	0.07	0.08	0.11	0.12	0.15	0.15
EBITDA margin (%)	--	--	--	--	43%	43%	43%	43%	44%	44%	45%	45%	45%	45%
Cash flow from ops (C$m)	-1	-1	-1	-1	39	39	26	40	55	62	77	85	101	108
Cash flow from investing (C$m)	-5	-5	-173	-163	-6	-6	-6	-56	-9	-59	-12	-62	-15	-15
FCF (C$m)	-1	-1	-6	-14	16	16	16	16	40	45	65	71	90	91
FCFPS (C$/sh)	-0.04	-0.03	-0.49	-0.31	0.06	0.06	0.06	-0.03	0.10	0.01	0.13	0.04	0.17	0.18
Net cash (C$m)	10	3	-45	-221	-204	-188	-186	-220	-186	-61	-2	225	308	399
ND/NTM EBITDA (x)	nmf	nmf	nmf	4.3	4.0	3.7	3.6	2.8	2.3	0.6	0.0	--	--	--
Debt borrowed (repaid) (C$m)	--	--	125	125	--	--	--	--	-20	--	-44	--	--	--
Equity raised (C$m)	10	--	130	1	1	--	--	--	--	--	--	--	--	--
Total Assets (C$m)	26	25	274	386	399	411	430	443	461	532	549	752	836	918
Total Liabilities (C$m)	1	1	126	251	251	251	258	258	242	160	119	73	77	77
Total Equity (C$m)	25	23	147	135	147	160	172	185	219	372	430	679	760	841
Ending shares out (m)	185	185	524	529	532	532	532	532	532	532	532	532	532	532
ROCE (%)	-6%	-6%	-1%	-0%	11%	10%	10%	11%	15%	14%	17%	12%	14%	13%
ROIC (%)	-10%	-7%	-1%	-0%	12%	12%	12%	10%	16%	15%	21%	20%	25%	25%
ROE (%)	-6%	-6%	-4%	-10%	8%	8%	7%	7%	16%	11%	14%	9%	11%	10%

Source: SCPe

ESG: Providing a lower carbon intensity, more environmentally attractive source of MSM is central to CDMN's sales strategy for OEMs.

Environmental: Providing a lower carbon intensity, more environmentally attractive source of MSM is central to CDMN's sales strategy for OEMs. Renewable grid power, rail and barging routes into the North America supply chain and auditable production processes are all advantages that Woodstock should have over other producers, in addition to the lower carbon and energy intensity of the carbonate process.

Social: Stakeholder engagement including local community, First Nations, local Government and downstream customers are all a central part of Canadian Manganese's strategy.

Governance: The board currently consists of six members, including Chairman John Kearney (ex Sulliden and Scandinavian Metals), CEO Matthew Allas, Director Danesh Varma (accounting and mining background), and three NEDs: John Hurley (private mining), John Allen (private Atlantic Canadian businessman), and Aidan Carey (VP Ops at Labrador Iron Mines). Two independent non-executive Directors are proposed for the upcoming AGM: Ms Janis Byrne (lawyer and board member of Atlantic Lottery Corp) and Labi Kousoulis (former Member of the Legislative Assembly of Nova Scotia 2013-2021).

Risks

Geological: We view this risk as moderate. While the resource is currently inferred, this is in the process of being infilled to 50m spacing to support reserves. Given the size and continuity we think the resource and reserve conversion are likely to be robust.

Mining: In our view mining is low risk as a low strip open pit in competent host rock. The tonnages involved are not particularly high for an open pit operation.

Development: We think risks are moderate given a modest sized build located near infrastructure. We think labour and staffing are the main issue but the labour market is less tight in the Maritime Provinces than in the traditional mining districts of Ontario and Quebec.

Processing/Metallurgy: While metallurgy is key given high spec end use, we believe Woodstock is lower risk than the rest of the peer group. Carbonate ore is readily leachable and therefore lower risk with regards to metallurgy. The key specs are iron content, which is addressed by the initial magnetic separation stage, as well as magnesium and calcium if going directly to HP MSM.

Infrastructure: We view this as low risk with road access to within 5km of site, rail within 16km of site, the town of Woodstock within 5km, the larger city of Fredericton within 105km.

Environmental: We view the risks here as low if CDMN pursues a magnetic separation at site. The project will require a full provincial EA process however it is not in an area noted for special environmental significance or biodiversity. Test work indicates the presence of carbonates means that mine residue has low potential for acid generation and low prevalence of heavy metals.

Political and Social: We view this risk as moderate. Development will require support from the local community, First Nations, and other stakeholders, in line with project development standards in Canada. We do not perceive particular risk with regards to the project setting, surrounding community and stakeholder relations.

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Summary of Recommendations as of June 2022	
BUY:	56
HOLD:	1
SELL:	0
UNDER REVIEW:	0
TENDER:	0
NOT RATED:	0
TOTAL	57

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