21 January 2025

Tivan achieves high-purity vanadium specification at Speewah

- **Tivan has completed a salt roast testwork program for the Speewah Vanadium Project that successfully produced high-purity vanadium pentoxide (V_2O_5) with a grade of 99.86% V_2O_5 without the use of solvent extraction.**
- **The testwork program was announced in February 2024 and was designed to evaluate the commercial viability of development pathway from Speewah ore to vanadium flow batteries ("VFB").**
- **The V_2O_5 produced is being used for vanadium electrolyte ("VE") preparation and testing at the University of New South Wales specifically targeting achievement of the VE specifications of Sumitomo Electric Industries. These results are expected in Q1.**
- **Tivan continues to progress its assessment of two vanadium processing technology pathways: TIVAN+ in strategic partnership with CSIRO and a conventional salt roast processing flowsheet.**

The Board of Tivan Limited (ASX: TVN) ("Tivan" or the "Company") is pleased to provide an update on the vanadium electrolyte testwork program being undertaken for the Speewah Vanadium Project ("Speewah") in Western Australia. This forms part of an assessment of two separate vanadium processing technology pathways under consideration for Speewah: the TIVAN+ processing technology in strategic partnership with CSIRO and a conventional salt roast processing flowsheet (see ASX announcement of 27 September 2024).

As previously announced, excellent preliminary testwork results had been achieved for both the TIVAN+ and salt roast technology pathways, providing Tivan with significant development optionality (see ASX announcements of 30 May 2024, 19 June 2024; 27 September 2024).

For the conventional salt roast pathway, Tivan has completed a testwork program that included desilication trials, purification trials and a set of bulk trials for the flowsheet from concentrate through to vanadium pentoxide production.

The testwork program was highly successful, producing high-purity V_2O_5 with a grade of 99.86% V_2O_5 without the use of solvent extraction. The V_2O_5 is suitable for the next phase of testwork targeting production of high-purity VE at the specifications provided by Sumitomo Electric Industries ("SEI"), a Japanese manufacturer of large-scale, long-life vanadium flow batteries (see ASX announcement of 28 February 2024).

Vanadium Electrolyte Program Development

The VE development program comprised of a set of sighter tests designed to assess the amenability of preparing a VE sample that meets the SEI specification, using the traditional salt roast method for vanadium extraction from Speewah vanadium titanomagnetite ("VTM") ore.

The technical highlights from the program are as follows:

Desilication

Desilication trials were designed to investigate a broad range of conditions across a number of tests with a focus on the impact of reagent dosing, pH and temperature. The outcomes from the desilication work were positive, demonstrating that there are parameters that will be suitable to prepare either a standard (98.5% V_2O_5) vanadium pentoxide product or a high purity >99.5% V_2O_5 product.

- >99% Si removal and <2% vanadium loss to prepare a solution better suited to preparation of a standard grade V_2O_5
- >99% Si removal and ~5-10% vanadium loss to prepare a solution better suited to preparation of a high-purity V_2O_5 product

Purification

The purification trials were preliminary tests to investigate two methods for upgrading the vanadium bearing solution prior to ammonium metavanadate ("AMV") calcination. AMV calcination is the standard industry process for preparing vanadium pentoxide. Solvent extraction shake tests were performed for three solvents for a range of processing parameters. The solvent extraction trials identified a promising solvent that could be utilised for future flowsheet development. Due to additional costs, solvent extraction is not Tivan's preferred method for purification of the vanadium solution and the need for development will be assessed before commissioning any future work programs.

The alternative tested purification flowsheet is simpler than a solvent extraction flowsheet, utilising precipitation reactions to purify and separate out a higher quality AMV product. These tests were very successful, preparing high purity AMV products at ~4% vanadium loss. This was selected as the preferred method for the bulk V_2O_5 preparation trials (see below).

Bulk Trial

~35 kg of Speewah VTM concentrate (2.44% V_2O_5) was processed from salt roasting through to AMV calcination, to prepare a V_2O_5 sample for VE testing. The testwork program was executed at ALS Balcatta utilising bulk batch conditions for each unit process.
The final vanadium pentoxide product has met the high purity target, achieving a grade of 99.86% V_2O_5.The high purity product is considered suitable for VE testing.

Process Area	Vanadium Recoveries
Salt Roasting	96.6%
Desilication	93.7%
Purification/AMV Precipitation	93.1%
Total Recovery	84.2%

Table 1: Bulk testwork recoveries summary

Image 1: Bulk desilication trial at ALS

The full vanadium pentoxide sample analysis included a 66-element suite (excluding vanadium), the assay data is summarised in Table 3 below.

Element	Unit	V_2O_5 Sample
Al	%	0.05
As	ppm	0.25
Fe	ppm	10.4
Ti	ppm	0.31
Mg	ppm	1.07
Ca	ppm	7.02
Cu	ppm	0.18
Cr	ppm	3.91
Si	ppm	91.6
K	ppm	1.30
Na	ppm	4.15
S	ppm	64.9
Sb	ppm	65.8
P	ppm	2.63
V_2O_5 (calculated – oxide basis)	*%*	*99.86*

Table 2: Vanadium pentoxide analysis

Summary

A goal of the program was to produce the high-purity V_2O_5 sample without the use of solvent extraction to simplify the flowsheet and reduce potential project costs. The alternative purification process trialled in this program met this goal and is a suitable processing solution as demonstrated by the outstanding vanadium pentoxide product grade.

The bulk testwork conditions for the desilication and purification areas were based on preliminary un-optimised batch conditions. Future testwork will include optimisation of processing parameters to target increased overall vanadium yield. Furthermore, in engineering studies, the viability of industry standard salt roasting flowsheet recycle streams will be investigated to improve the total plant recovery.

Refer to Appendix 1 for desilication and purification results.

Next Steps

The program has successfully achieved the target high-purity vanadium pentoxide specification, and the sample is now being used for VE preparation and testing. This program has commenced at UNSW and is expected to be completed in Q1. Tivan will provide an update on the final outcomes of the program following completion.

As previously announced, since the publication of the CSIRO TIVAN+ testwork results in May 2024, Tivan has received significant third-party interest in the technology, including from VTM resource owners in Australia and overseas (see ASX announcement of 27 September 2024). Tivan continues to advance opportunities for collaboration in conjunction with CSIRO and expects to provide a status update in Q1. Tivan notes that while there is significant third-party interest in the TIVAN+ technology, there is no guarantee or certainty that a commercial arrangement or sublicensing agreement will eventuate.

Tivan Executive Chairman Mr Grant Wilson commented:

"The outstanding testwork results achieved by Tivan's process engineering team confirm Speewah's status as Australia's premier VTM resource and the technical viability of the pathway to supply vanadium flow batteries at scale. Speewah's comparative advantages include high vanadium in concentrate grade, low strip ratio, close proximity to port and vast size. In addition, the Speewah Fluorite Project will introduce enabling infrastructure to the site location, further reducing project costs and establishing a durable social licence to operate in the East Kimberley region.

While the commercial pathway to develop a vanadium project in Australia remains challenging, the testwork results and our rapid progress with the Speewah Fluorite Project, put Tivan in poll position. We will continue to advance the project development pathway, ensuring that the Speewah Vanadium Project contributes to Tivan's sum of parts valuation and in support of the development of long-duration energy storage capabilities across northern Australia."

This announcement has been approved by the Board of the Company.

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Competent Person's Statement

Tivan's exploration activities, including for the Speewah Project, are being overseen by Mr Stephen Walsh (BSc). The information that relates to exploration results in this announcement is based on and fairly represents information and supporting documentation prepared and compiled by Mr Walsh, a Competent Person, who is the Chief Geologist and an employee of Tivan, and a member of the Australasian Institute of Mining and Metallurgy (AusIMM). Mr Walsh has sufficient experience of relevance to the styles of mineralisation and the types of deposits under consideration, and to the activities undertaken, to qualify as a Competent Person as defined in the 2012 Edition of the Joint Ore Reserves Committee (JORC) Australasian Code for Reporting of Exploration Results. Mr Walsh consents to the inclusion in this announcement of the matters based on information compiled by him in the form and context which it appears.

The information in this announcement that relates to exploration results for the Speewah Project (TIVAN+ testwork program) has been extracted from the Company's previous ASX announcements entitled "Tivan & CSIRO successfully complete TIVAN+ Testwork Program" dated 30 May 2024 and "Update on Vanadium Electrolyte Testwork Program" dated 19 June 2024. Copies of these announcements are available at www.asx.com.au or www.tivan.com.au/investors/asx-announcements/. The Company confirms that it is not aware of any new information or data that materially affects the information included in those announcements. Tivan confirms that the form and context in which the Competent Person's findings are presented have not been materially modified from those announcements.

Forward looking statement

This announcement contains certain "forward-looking statements" and comments about future matters. Forward-looking statements can generally be identified by the use of forward-looking words such as, "expect", "anticipate", "likely", "intend", "should", "estimate", "target", "outlook", and other similar expressions and include, but are not limited to, the timing, outcome and effects of the future studies, project development and other work. Indications of, and guidance or outlook on, future earnings, financial position, performance of the Company or global markets for relevant commodities are also forward-looking statements. You are cautioned not to place undue reliance on forward-looking statements. Any such statements, opinions and estimates in this announcement speak only as of the date hereof, are preliminary views and are based on assumptions and contingencies subject to change without notice. Forward-looking statements are provided as a general guide only. There can be no assurance that actual outcomes will not differ materially from these forward-looking statements. Any such forward looking statement also inherently involves known and unknown risks, uncertainties and other factors and may involve significant elements of subjective judgement and assumptions that may cause actual results, performance and achievements to differ. Except as required by law the Company undertakes no obligation to finalise, check, supplement, revise or update forward-looking statements in the future, regardless of whether new information, future events or results or other factors affect the information contained in this announcement.

Appendix 1 - Desilication and Purification Results

Table 3: Desilication Results

Trial	Vanadium Loss (%)	Silica Precipitation (%)
HY18778	0.2	99.1
HY18779	0.4	99.9
HY18780	0.9	99.2
HY18781	4.7	99.9
HY18958	0.2	99.1
HY18959	1.8	99.8
HY19020	9.0	99.7

Table 4: Purification Results

Trial	Vanadium Recovery (%)
Trial 1	65.4
Trial 2	96.3
Trial 3	95.4

JORC Code, 2012 Edition - Table 1 Report

SECTION 1 SAMPLING TECHNIQUES AND DATA		
Criteria	**JORC Code explanation**	**Commentary**
Sampling techniques	• *Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.* • *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* • *Aspects of the determination of mineralisation that are Material to the Public Report.* • *In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.*	• The metallurgical testwork program was completed on a titanomagnetite concentrate sample received in the Speewah Project acquisition from King River Resources Limited ("KRR"). • The sample used is a p80 45 micron high grade concentrate that assayed 2.44% V_2O_5 produced from a RC chips sample by magnetic separation methods in 2011.
Drilling techniques	• *Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).*	• No new drilling was completed in preparation for the testwork reported in this announcement. • The testwork described in this announcement was completed on titanomagnetite concentrate derived from RC drilling with a face-sampling bit.
Drill sample recovery	• *Method of recording and assessing core and chip sample recoveries and results assessed.* • *Measures taken to maximise sample recovery and ensure representative nature of the samples.* • *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.*	• RC chip samples from every 1 metre drilled interval were sampled and composited. The host gabbro is fresh from near surface and sample recovery into RC bags was high. • No relationship between grade and recovery has been identified.
Logging	• *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* • *The total length and percentage of the relevant intersections logged.*	• RC drill 1 metre intervals logged 100% from surface to end-of-hole.
Sub-sampling techniques and sample preparation	• *If core, whether cut or sawn and whether quarter, half or all core taken.* • *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* • *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* • *Quality control procedures adopted for all sub-sampling stages to maximize representivity of samples.* • *Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling.*	• RC bags were re-sampled to collect a 6 tonne composite sample for testwork. • The average grade of the 6 tonne sample compares with the drill assayed intervals for the HG zone. • Subsampling was performed during the preparation stage according to the metallurgical laboratories' internal protocol. • RC chips from every 1 metre interval were sampled and composited. The final composited grade compares favourably with the average V, Ti and

	• *Whether sample sizes are appropriate to the grain size of the material being sampled.*	Fe grades from the drill assays for the HG zones of the vanadium deposit. • Sample sizes were considered appropriate to the grain size of the material being sampled.
Quality of assay data and laboratory tests	• *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* • *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* • *Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.*	For the testwork program reported in this announcement: • Solid sample analyses in the program were conducted by X-Ray Fluorescence ("XRF") at ALS Global • AMV analyses in the program were conducted by ICP at ALS Global • Vanadium pentoxide analysis performed by Labwest Minerals Analysis • Standards, blanks and duplicates were utilised as per each respective laboratories standard QAQC procedures.
Verification of sampling and assaying	• *The verification of significant intersections by either independent or alternative company personnel.* • *The use of twinned holes.* • *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* • *Discuss any adjustment to assay data.*	• Significant drill intersections have been verified by alternative company personnel. • Data is incorporated into a digital database, assays from laboratories received in a digital format. • No adjustments or calibrations made to primary assay data collected for the purpose of reporting assay grades and mineralized intervals.
Location of data points	• *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* • *Specification of the grid system used.* • *Quality and adequacy of topographic control.*	• Almost 90% of the collars used in the resource estimate were surveyed using a differential global positioning system instrument, with the remaining surveyed using a hand-held GPS. Downhole deviations were measured by downhole survey instruments on 3 holes only using a Globaltech Pathfinder digital downhole camera. All but four holes are vertical. All metallurgical holes are vertical. The vertical and shallow nature of the drilling means that the absence of downhole surveys is not considered a material risk. • The adopted grid system is GDA 94 Zone 52.
Data spacing and distribution	• *Data spacing for reporting of Exploration Results.* • *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* • *Whether sample compositing has been applied.*	• RC drill spacing is mostly 250 m by 250 m in the deposit, closing down to 100 m by 100 m in the Western Area. • The Competent Person believes the mineralised domains have sufficient geological and grade continuity to support the classification applied to the Mineral Resources given the current drill pattern. • The RC composite represents the HG zone within the magnetite gabbro within the resource envelope. This was considered appropriate given the

		metallurgical testwork was designed to test the HG zones of mineralisation and it provided for a bulk sample suitable for testwork.
Orientation of data in relation to geological structure	• *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* • *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.*	• All RC holes are vertical. This allowed the holes to intersect the mineralisation at a high angle as the magnetite gabbro has a very shallow dip to the East. • The relationship between the drilling orientation and the orientation of key mineralised structures is not considered to have introduced sampling bias.
Sample security	• *The measures taken to ensure sample security.*	• The titanomagnetite concentrate stored at Nagrom under job number T687; was transported to a secure site followed by delivery to the metallurgical laboratory by the Company.
Audits or reviews	• *The results of any audits or reviews of sampling techniques and data.*	• No external audits have been completed.
SECTION 2 REPORTING OF EXPLORATION RESULTS		
Criteria	**JORC Code explanation**	**Commentary**
Mineral tenement and land tenure status	• *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.* • *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.*	• The Speewah Project comprises two Exploration Licences (E80/2863, E80/3657), three Mining Leases (M80/267, M80/268, M80/269) and two Miscellaneous Licences (L80/43, L80/47). The tenements are 100% owned by Speewah Mining Pty Ltd (a wholly owned subsidiary of Tivan Limited), and are located over the Speewah Dome, 100 km SW of Kununurra in the East Kimberley. The testwork described in this announcement was on samples collected entirely within E80/2863. The tenements are in good standing and no known impediments exist.
Exploration done by other parties	• *Acknowledgment and appraisal of exploration by other parties.*	Historical exploration: • All exploration and testwork relevant to the preparation of the titanomagnetite concentrate utilised for the testwork described in this announcement was managed by KRR.
Geology	• *Deposit type, geological setting, and style of mineralisation.*	• The deposits represent part of a large layered intrusion (the Hart Dolerite), which was intruded c1790 Ma into the Palaeo-Proterozoic sediments and minor volcanics of the 1814 Ma Speewah Group in the East Kimberley Region of Western Australia. The deposits occur within the Speewah Dome, which is an elongated antiform trending N-S. The dome is about 30 km long and attains a maximum width of about 15 km. The Hart Dolerite sill forms the core of the dome. Two distinct types of felsic granophyres (K felsic granophyre and Mafic granophyre) and three mafic gabbros

		(pegmatoidal gabbro, magnetite gabbro and felsic gabbro) have been identified in the Hart Dolerite. The vanadium-titanium mineralisation is hosted within a magnetite bearing gabbro unit which is up to 80 m thick. Given the mode of formation, mineralisation displays excellent geological and grade continuity. Exposure is limited and fresh rock either outcrops or is at a shallow depth of a few metres. Ti-V-Fe mineralisation occurs as disseminations of vanadiferous titanomagnetite and ilmenite. The Speewah Project comprises three deposits (Central, Buckman and Red Hill). The reported Mineral Resource lies entirely within fresh magnetite gabbro of the Hart Dolerite sill within the Speewah Dome. The magnetite gabbro unit can be subdivided into an upper low grade zone and a basal high grade zone, based on increasing vanadium tenor (grade) in the magnetite grains towards the base of the unit.

Drill hole Information	• *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:*
	  ○ *easting and northing of the drill hole collar*
	  ○ *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar*
	  ○ *dip and azimuth of the hole*
	  ○ *down hole length and interception depth*
	  ○ *hole length.*
	• *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.*
		• No new drilling is reported in this release.
		• The hole data is not presented in this announcement. This information is not considered material as the concentrate was prepared from many holes across the deposit. Therefore, the testwork results for the concentrate can only show the generalised response of the orebody, and not variability due to location throughout the orebody.

Data aggregation methods	• *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated.* • *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* • *The assumptions used for any reporting of metal equivalent values should be clearly stated.*	• RC chip samples from every 1 metre drilled interval were sampled and composited. The final composited grade compares favourably with the average V, Ti and Fe grades from the drill assays average grades for the HG zones of the vanadium deposit. • Metal equivalent values have not been used for reporting.
Relationship between mineralisation widths and intercept lengths	• *These relationships are particularly important in the reporting of Exploration Results.* • *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.* • *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').*	• Due to the very shallow dip of the mineralisation, the vertical holes represent almost the true width of the mineralisation.

Diagrams	• *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.*	• No new drilling is reported in this release.
Balanced reporting	• *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.*	• All relevant results have been reported
Other substantive exploration data	• *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.*	• All relevant data is included in the body of the announcement.
Further work	• *The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).* • *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.*	• See body of announcement.