Appendix C

Correspondence Related to the Audit

Subject: FW: 41 Boulter Road Berrimah Site Audit - Issues Related to Reporting of Stockpiles

From: David Tully [mailto:David.Tully@coffey.com]
Sent: Monday, 5 May 2014 11:39 AM
To: Mike Nash
Cc: Felicia Mellors; Andrew Gane
Subject: RE: 41 Boulter Road Berrimah Site Audit - Issues Related to Reporting of Stockpiles

Mike,

Many thanks for your email and earlier call.

We are regarding this matter with great concern and will endeavour to address the issues regarding the stockpiles as quickly as possible. Unfortunately it is the May Day public holiday today in NT so we have not been able to speak directly to our field scientist but have left a message for her to contact us as soon as possible.

We have also emailed the client for confirmation of the source of the stockpiled material and to ascertain what is proposed to be done with the material.

We will also endeavour to determine exactly what has gone wrong here in terms of communication that has led to what appears to be an inaccurate description of site conditions and will report back to you on this.

Kind regards,

David

Dr David Tully
Senior Principal Geoenvironmental Engineer

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From: Mike Nash [mailto:Mike.Nash@douglaspartners.com.au]
Sent: Monday, 5 May 2014 10:20 AM
To: David Tully
Cc: Felicia Mellors; Andrew Gane
Subject: 41 Boulter Road Berrimah Site Audit - Issues Related to Reporting of Stockpiles

David

Further to our discussion this morning and in regard to the above site audit I refer to Coffey's reports as follows:

- Coffey (2013). Site Contamination Assessment 41 Boulter Road, Berrimah, Northern Territory, dated 17 October 2013;
- Coffey (2014). Supplementary Detailed Site Investigation Sampling Analysis and Quality Plan 41 Boulter Road, Berrimah, Northern Territory, dated 11 March 2014;
- Coffey (2014). Site Contamination Assessment (Preliminary Site Investigation and Detailed Site Investigation), Version 2, 41 Boulter Road Berrimah, Northern Territory, dated 2 April 2014.

As you know I am undertaking an audit for the above site and of the investigations by Coffey and I am in the final stages of audit preparation.

Over the weekend I made a comparison of the site description in the Coffey PSI, SAQP and DSI (see above) with DP's own site inspections dated 19 March 2014, and DP's subsequent inspection undertaken yesterday - 4 May 2014 (see attachments) and I have some serious doubts about the accuracy of what has been reported by Coffey specifically regarding the presence of stockpiles on the site. As a result I also now have concerns regarding the accuracy of Coffey's conclusions regarding site

suitability as plainly the stockpiles observed by DP during both site inspections were not reported by Coffey and accordingly neither was their nature, size and content - which has serious implications for the timing and conclusions of the audit.

In this regard I understand that the client (John Tannos) is now urgently seeking audit completion in relation to his development permit.

In this regard I draw your attention to the following sections of Coffey's reports:

The PSI dated 17 October 2013, see Executive Summary and Section 2.1 and 2.5.1 and Figure 2 which indicated that:

'... Stockpiles were noted at the site comprising primarily of vegetation that had been recently cleared with limited soil that was insufficient for sampling purposes...'.

And

"...Stockpiles were noted at the site comprising primarily of vegetation that had been recently cleared with limited soil that was insufficient for sampling purposes... '.

The SAQP dated 11 March 2014 see Section 2.1 page 2 which indicated that:

"... Some stockpiles of vegetation remain at the site...'.

The PSI/DSI dated 2 April 2014 see Section 2.3 page 4 [Note site works for the DSI were undertaken on March 2014] which indicated that:

'... Stockpiles were observed at the site during the initial walkover comprising primarily of vegetation that had been recently cleared with limited soil that was insufficient for sampling purposes. ***The stockpiles were noted to have been removed prior to the Stage Two field works in March 2014...'.***

In particular the above statement in the final report dated 2 April appears to be completely at odds to what was observed and recorded by DP's site representative during Coffey's site works on 19 March 2014 inasmuch as DP's field engineer Andrew Gane (from DP's Darwin office) observed and recorded 4 stockpiles containing soil with vegetation cover (see attached drawing and photographs) in the centre and north of the site and one large soil stockpile measuring 50x8x2m (500 m3) and one large mulch stockpile in the northern part of the site. None of these were reported by Coffey in the final DSI (but were apparently pointed out to your field staff by DP's engineer on site).

This omission from Coffey's DSI report clearly has serious implications for audit completion and I take this matter very seriously. Accordingly I would ask that you to clarify this situation with your site staff and provide an explanation as to why no mention of significant volumes of stockpiled soil was made in the DSI (particularly noting that the stockpiles previously identified were noted to have been removed), as this omission in my view has very serious implications in terms of the characterisation of the site, particularly noting that significant volumes of materials stripped from the site have not apparently been tested and that the proposed fate of these stockpiles has also not been confirmed.

Accordingly as a matter of some urgency can Coffey consider the following enquiries and provide a response:

- Why was reference to these stockpiles omitted in the final DSI report?
- Why was no sampling of the stockpiles undertaken during the DSI?
- Are the 4 smaller stockpiles observed by DP the same as those reported by Coffey in the PSI and SAQP? If not what is their source if they are then why is Coffey's description of the soil content at odds with what was reported by DP as a result of the site inspection dated 19 March 2014?
- If the stockpiles were imported what was their source(s) and why wasn't the material subsequently reported and characterised either to remain on site or for waste disposal?
- When were the stockpiles placed/formed on site and from what materials?
- If the stockpiles represent stripped materials originating from the site what is the likelihood that they contain contaminated materials which as yet remains untested either in terms of re-use on the site or in terms of waste characterisation for off-site disposal?
- What is the intention regarding these stockpiles noting that at 4 May 2014 these were still present on the site. Are the materials (up to 700 m3) to be re-spread across the site, or disposed off-site? [If the former they may represent a

potential for re-contamination of the site, if the latter then this will represent the disposal of uncharacterised wastes which may have implications under the local waste management regulations].

- What is Coffey's proposal to rectify this situation - I would suggest that this would involve (at a minimum) sampling of the stockpiles according to Schedule B2 of NEPM (2013) to determine suitability.

I look forward to your urgent response and trust that you will discuss this issue with the client in the interim.

Kind regards.

Please note that the above information, interim advice and opinions do not pre-empt the eventual site audit findings nor do they constitute a site audit as defined under Part 4 of the Contaminated Land Management Act, 1997, or as defined by NT EPA in adopting the NSW scheme.

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Subject: FW: 41 Boulter Road Berrimah Site Audit - Issues Related to Reporting of Stockpiles

From: Mike Nash
Sent: Wednesday, 7 May 2014 10:44 AM
To: 'Felicia Mellors'; john@dshnt.com.au
Cc: David Tully
Subject: RE: 41 Boulter Road Berrimah Site Audit - Issues Related to Reporting of Stockpiles

Felicia

Thanks for the prompt response.

The proposed scope looks generally OK, but I have the following questions:

- Why analyse only 2 samples for the Broad Contaminant Screen? I am not clear on how or why this would necessarily be statistically representative of the volume of materials in question. We need to be sure that this material is suitable for standard residential land use, accordingly I would strongly suggest that additional representative samples are analysed for this suite – i.e. more in line with the proposed metals suite.
- What method of sampling is proposed? Based on the dimensions of the large stockpile it would appear that you will need to use a backhoe to open it up to enable representative sampling (not just from the surface but from the core) - rather than using hand tools which may be what you intended. Can you please confirm? Please also confirm that standard field decontamination procedures will be undertaken between sampling locations/horizons.
- Regarding the source site – can you confirm whether the source area was filled (raised) following 1982 i.e. as part of the East Arm development since 2000?

Kind regards.

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From: Felicia Mellors [mailto:Felicia.Mellors@coffey.com]
Sent: Wednesday, 7 May 2014 10:16 AM

To: Mike Nash; john@dshnt.com.au
Cc: David Tully
Subject: 41 Boulter Road Berrimah Site Audit - Issues Related to Reporting of Stockpiles

Mike,

Thanks for the phone call yesterday afternoon. Please see below answers to the queries regarding the stockpiles and our scope of works to close this out:

We understand from discussions with the client that the large soil stockpile at the Berrimah site has been imported from Dawson Street on the Hudson Creek, East Arm development, approximately 6.5km directly south of the Boulter Road site. We also understand that this material is to be utilised on-site as part of the development.

We have an aerial photograph from 1982 that shows the Hudson Creek, East Arm area as undeveloped with what appears to be mangrove/scrub vegetation cover (see attached image).
Land development corporation have been developing East Arm since approximately 2000 when the East Arm Wharf was completed. The Google Earth website has satellite images of the area dating from 2003 which show progressive development of the area through the 2000s to the present. The present day Google Earth image is attached showing the location of Dawson Street. The historical imagery can be viewed by going directly to the Google Earth website and clicking on the 'historical imagery' icon on the tool bar.

It is therefore apparent that it is unlikely that significant potentially contaminating activities have taken place in the vicinity of the stockpile source area. However, as discussed for surety, to confirm that the soil is suitable for use on the site, we will undertake sampling and analysis of the material for a suite of common potential contaminants

Subject to authorisation by the client, Coffey propose to:
Visit site on Thursday 8 May in the morning (7:30AM) to sample the large soil stockpile (estimated 500m^3)
10 samples plus a duplicate/triplicate will be collected from the stockpile as per the NEPM 2013 given the soil appears to be homogenous and submitted for analysis as follows:

8 samples plus the duplicate/triplicate for metals (ANZECC)

2 samples for a Broad Contaminant Screen (Metals (ANZECC), cyanide, fluoride, TRH, BTEX, SVOCs, total phenols, VHCs and pH).

In addition, the soil samples will be screened for VOCs using a PID and samples with elevated PID readings will be submitted for TRH analysis.

Coffey will update the report to include an updated site description and an additional appendix detailing:

The site history of the source of the soil stockpile (Dawson Street, East Arm).

Results of the stockpile sampling as discussion in relation to relevant health investigation and screening levels.

Coffey will issue the updated report no later than Friday 16 May for your review and inclusion in your Audit report.

The four small stockpiles identified are primarily mulch from the palm and mango trees onsite – they were moved between works and a minor amount of surface soil was scrapped in the piles when pulled together. This soil has already been characterised from the investigation works we have undertaken previously and therefore we do not propose to undertake additional sampling/analysis of the soil within these piles. We understand from the client that this material is likely to remain on site.

With regard to the other large stockpile of mulch which we understand is also site derived from previous vegetation and the client has informed us that some of this material may be used in the development, but the majority is likely to be surplus to requirements and will probably be given away. We do not propose to sample this material.

As discussed yesterday, please could you provide confirmation that our approach set out above is acceptable.

Regards

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coffey

Please consider the environment before printing this email

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Memorandum

To	felicia.mellors@coffey.com	Coffey Environments	08 8947 3020
cc	john@dshnt.com.au	John Tannos Demountable Sales & Hire	08 8375 4499
From	Mike Nash	**Date**	3 March 2014
Subject	Statutory Site Audit - DP/NT/105 41 Boulter Road Berrimah NT	**Project No.**	73847

Attention: Felicia Mellors

Thank you for the draft Supplementary Detailed Site Investigation Sampling Analysis and Quality Plan (SAQP), dated 24 Feb 2014 for the above site.

I have a few comments on Section 5 of the proposed SAQP as follows:

1. I agree that further sampling and analysis of hydrocarbons is probably unnecessary based on the known site history, although assuming that machinery was fuelled on site there may be some risks of buried fuel drums. Presumably there is no evidence or likelihood of buried drums or tanks. If drums or tanks cannot be ruled out then any hotspot may well be substantially greater than the 1.0 m diameter you have indicated in Table 5.1.
2. Noting that the proposed sampling locations are immediately adjacent to the existing test pits (TP1-10) then there is a strong likelihood that any visual or olfactory evidence of TPH would be the same as that observed in the original test pits and will thus not really extend the current coverage of the site. Accordingly, in the auditor's view the proposed testing would be best located away from the current test pits rather than next to them, where presumably any observed evidence would already have been reported.
3. The proposed analytical regime for agrochemicals is generally agreed (OCPs, OPPs, herbicides, metals), however, the proposed sampling locations and sampling density is not considered to be optimum in terms of the overall sampling density. In this regard and as pointed out previously the auditor does not consider that 10 locations are sufficient to adequately characterise a site of 1.4 ha, or to provide a robust data set for statistical interpretation - irrespective of the contaminant laydown mechanism.
4. In addition, whilst your points regarding sampling density in regard to the amended NEPM are well taken, I am disinclined to agree to this approach and would far rather see a higher sampling density (say 24 locations) for this site, but perhaps employing composite sampling and analysis of surficial samples. This in my view should provide a far wider coverage and characterisation of the site then is currently available (or proposed). Moreover, if 24 locations were tested and composite samples were analysed (plus field QA/QC) then it is likely that the testing and analytical costs would not be dissimilar to those involving discrete sampling from 10 locations. At present 10 locations are in my view insufficient to provide adequate site coverage (i.e. 10 samples equates to only a 37.5 m square grid).

5. The Guidelines for Assessing Former Orchards and Market Gardens, NSW EPA 2005, indicates that site assessors should consider the possibility of over-application of pesticides, such as in the vicinity of tractor turning circles at the end of cultivation rows (Coffey have indicated that a tractor was present on the site) and potential pesticide/herbicide storage or mixing areas, equipment filling areas (if this occurred), or drum burial. Accordingly, hotspots of pesticide, herbicides and metals could have occurred despite the fact that uniform application was the most likely laydown mechanism over the majority of the site.
6. Twenty four shallow locations tested on a regular grid basis would in the auditor's view provide a much better site coverage than the 10 locations currently proposed and would provide greater certainty that no hotspots were present whilst still providing a reasonable basis for determining site statistics. Samples for analysis of pH and CEC could be taken at the same time. Provision for re-analysis should be made in case any samples exceed the amended criteria for composites (assuming that Coffey agree that composite sampling is a realistic option).
7. In regard to the above I note that Section 6.2.6 of Schedule B2 of the ASC NEPM 2013 indicates that composite sampling of OC/OP pesticides is not appropriate, but NSW EPA consider that their guideline remains applicable [in regard to the use of NSW guidelines please note that NSW EPA consider that all current guidelines remain applicable and I am currently checking NT EPA's corresponding policy in this regard]. I also consider that the argument against composite sampling based on volatility in this instance is irrelevant particularly noting the time since application etc. Coffey may wish to comment in this regard.
8. Can Coffey confirm to what depth the sampling with hand tools will extend? Assuming that the first (main) sample is obtained from 0-100 mm depth then a second deeper sample would be worthwhile say 100-250 mm in case there is a need to analyse deeper as a result of an exceedance in the surface sample.
9. Please identify the main and subsidiary laboratories that are to be deployed.

Please contact the undersigned if you have any questions on these comments.

Douglas Partners Pty Ltd

J M Nash
Principal

Please note that the above information, interim advice and opinions do not pre-empt the eventual site audit findings nor do they constitute a site audit as defined under Part 4 of the Contaminated Land Management Act, 1997, or as defined by NT EPA in adopting the NSW scheme.

From: Mike Nash
Sent: Thursday, 27 February 2014 2:52 PM
To: 'Annie Andrews'
Subject: 41 Boulter Road Berrimah Site Audit
Attachments: ENAUKESW01228AB-R01A Draft Coffey SAQP .pdf

Annie

Further to previous correspondence on 17 Feb please find attached Coffey's proposed sampling plan for further testing at the above site.

I note that Coffey intend to sample only 10 locations (adjacent to the existing 10 test pits) for surficial traces of OCP, OPP and metals. The site occupies some 1.4 ha.

Whilst the analytical regime is probably reasonable based on the site history and previous sampling the proposed sampling density is still not intended to meet the Sampling Design Guidelines, NSW EPA 1995 or AS4482.1-2005. This has been determined on the basis that the current NEPM does not define sampling densities or the need to detect circular hotspots (i.e. where no hotspots are anticipated and as a result of the even distribution of contamination – which is likely in the case of these contaminants) – see S.5.1 pages 14-16 of the Coffey SAQP.

I am disinclined to accept this approach and would rather see a higher sampling density (say 24 locations for this site) perhaps with composite sampling and analysis of surficial samples in order to fully characterise the entire site, i.e. according to the Guidelines for Assessing Former Orchards and Market Gardens, NSW EPA 2005.

However, Coffey are quite correct in stating that there is no stated sampling density in ASC NEPM 2013 for circumstances where hotspot conditions are unlikely. Notwithstanding on this site there is no information about storage or equipment filling on the site and thus hotspots of pesticide, herbicides and metals could occur. NSW EPA (2005) also indicate that site assessment should consider the possibility of over-application, such as in the vicinity of tractor turning circles at the end of cultivation rows. Coffey have indicated that a tractor was present on the site.

My question in this regard is can NT EPA please indicate what their policy is in regard to the adoption of the NSW EPA Sampling Design Guidelines 1995 and/or AS4482.1-2005, as opposed to the new NEPM (noting that NSW EPA still require that their guidelines are followed by auditors – and presumably are therefore adopted by consultants). Certainly until ASC NEPM 2013 was published it would not have been readily accepted to undertake <50% sampling density on a site such as this without careful justification, and probably not even then! Similarly could NT EPA indicate whether they endorse the Guidelines for Assessing Former Orchards and Market Gardens, NSW EPA 2005?

Kind regards.

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From: Arminda Ryan <Arminda.Ryan@epa.nsw.gov.au> on behalf of EPA Contaminated Sites Policy Unit <consites.policy@epa.nsw.gov.au>
Sent: Friday, 28 February 2014 12:21 PM
To: Mike Nash
Cc: EPA Contaminated Sites Policy Unit
Subject: RE: ASC NEPM vs Guidelines for Assessing Former Orchards and Market Gardens

Dear Mike

I am acknowledging receipt of your email and will respond at a later date as I can't answer the NEPM part of your query. I will have to put that to the NEPM working group.

Regards,
Arminda

Arminda Ryan

Senior Audit Officer, Contaminated Sites Section | **NSW Environment Protection Authority** |

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From: Mike Nash [mailto:Mike.Nash@douglaspartners.com.au]
Sent: Friday, 28 February 2014 11:57 AM
To: EPA Contaminated Sites Policy Unit Mailbox
Cc: Ryan Arminda
Subject: ASC NEPM vs Guidelines for Assessing Former Orchards and Market Gardens

Arminda

Further to my recent email on sampling design I have another related question in relation to which guideline auditor's should apply.

The Guidelines for Assessing Former Orchards and Market Gardens (2005) have provisions for composite sampling involving pesticides including OCPs. Whereas the amended NEPM states in Section 6.2.6 that composite sampling is unsuitable for OC/OP pesticides etc. (page 25).

From discussions I don't believe the NEPM is correct in this regard as surely the 'active ingredients' of OCPs are not really volatile or semi-volatile (if they were then they wouldn't be much use after application having volatilised off).

I am currently in the midst of an audit where composite sampling on a former orchard is a distinct possibility - can EPA advise which guideline is correct and/or whether the EPA guideline has been superseded by NEPM particularly with regard to composite sampling where OCPs are involved?

Cheers.

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Memorandum

To	felicia.mellors@coffey.com	Coffey Environments	08 8947 3020
cc	john@dshnt.com.au	John Tannos Demountable Sales & Hire	08 8375 4499
From	Mike Nash	**Date**	12 February 2014
Subject	Statutory Site Audit - DP/NT/105 41 Boulter Road Berrimah NT	**Project No.**	73847

Attention: Felicia Mellors

I have been appointed by Mr John Tannos of LJ Superfund Pty Ltd to undertake a statutory audit of the above land. The audit has been notified to the NT EPA.

Coffey Environment's report entitled 'Site Contamination Assessment 41 Boulter Road, Berrimah, Northern Territory', dated 17 October 2013 (ref ENAUKESW01228AA-R01) has been forwarded to me by the client along with the relevant planning documentation - (Development Permit DP12/0309, dated 22 June 2012).

I have reviewed the above report, as required, under the audit process (based on the NSW EPA site auditor scheme) and have the following comments on the above report. In this regard, I have presumed that Coffey will be commissioned to provide an appropriate response and to undertake any further work which is considered necessary. If this is not the case please let me know.

General Comments on the Report

In the Executive Summary (Objectives) it is implied that the report comprises a Preliminary Site Investigation (PSI) and a Detailed Site Investigation (DSI), however, it is not evident from either the title of the report (as above) nor from the remainder of the contents of the report that the DSI was actually completed. In the auditor's opinion that whilst the report probably exceeds what might generally be expected from a PSI (in terms of sampling) the investigation does not comprise a full DSI noting in particular that the sampling density adopted (10 locations) does not meet the minimum specified for a site of 1.4 ha, and more particularly noting that the recent land use includes a former nursery.

In addition, it is noted from the correspondence with NT EPA (report's appendices) that whilst they have indicated that the scope of works was sufficient for a PSI the implication is that the Authority did not consider that this was sufficient for a DSI. Moreover, whilst Coffey have indicated that they do not expect that further investigations would be required and that the investigation has not revealed any potentially unacceptable long term risks to human health or the environment that would preclude the use of the site for sensitive purposes, the auditor notes that these conclusions appear to be based on a sampling density (design) which does not meet the required minimum specified in either the NSW EPA Sampling Design Guidelines (1995) or in AS4482.1-2005. Accordingly, it is the auditor's view that further testing is required to at least bring the sampling density up to the minimum which would be required to adequately characterize the site (area) and from which to be able to reasonably draw the

conclusions as set out in the Coffey report. Coffey are of course at liberty to argue this point and provide justification as to why the sampling design adopted, which is less than half which would normally be expected, is adequate. Please comment accordingly.

Section by Section

Section 1.1 - Background

It appears that Coffey were contracted to conduct a PSI and DSI, however, the report does not in the auditor's view comprise both types of report and whilst the report is arguably more comprehensive (in terms of testing) than would normally be the case for a PSI, there is no indication that the report comprises a full DSI. Certainly the sampling design adopted does not meet the minimum requirements for a DSI as alluded to above.

As also noted above, whilst the approval received from NT EPA for the investigation (**Appendix A** of the report) indicated that the scope was sufficient for a PSI it did not endorse the scope in terms of its adequacy for a DSI. Accordingly, the auditor is of the view that further investigations are required to at least bring the sampling (and analytical) density up to the minimum which would be required to adequately characterize the site (1.4ha). Please comment accordingly.

Section 1.2 - Objective

The objectives of the report as set out in this section appear to contradict those set out in the Executive Summary in as much as there is no mention of PSI and DSI, whereas the other objectives appear to be the same culminating in the final objective (dot point) which indicates that the report would provide advice on future environmental assessment of the site (if required). One of the objectives of the report (or at least the DSI) should have been to provide an opinion on the site's suitability for the proposed land use, which in this case is understood to be residential land use (as per the current zoning). Please comment accordingly.

Section 1.3 - Information Sources

Dot point 2 implies that the report comprises a PSI (and not necessarily a DSI) as noted above. Please comment.

Dot point 3 implies that field work investigated groundwater conditions, but the test pits reached a depth of only ~2.0 m and no groundwater was encountered in any of the pits. Please advise how groundwater conditions were evaluated at the site by the testing actually undertaken.

The auditor also notes that at the end of this section Coffey indicates that it takes no responsibility for the accuracy of information contained in third party reports. Can Coffey specify if this disclaimer extends specifically to the laboratory reports and if so how can Coffey rely on this information if they are not willing to attest to its accuracy - which of course should comprise part of the QA/QC review (DQOs and DQIs) of the laboratory data through the PARCC process. Please comment accordingly.

Section 2.1 - General Site Description

Please verify that the site area does in fact comprise 1.4ha as stated in Table A by confirming the dimensions of the site, which I note from the various plans appear to be 60.1m x 232.18m (13954 m^2) and as a consequence please justify the adopted sampling density of 10 (test pit) locations when compared with the minimum (systematic – grid based) sampling density of a site of this area i.e. 24 locations (as per NSW EPA, 1995 and AS4482.1 – 2005) and which would be the minimum requirement for a DSI.

Section 2.2 – Zoning

The zoning would presumably allow residential development with access to soils as defined in the NEPM 2013, please comment.

Section 2.3 - Environment and Heritage

No comments.

Section 2.4 - Surrounding Land Use

Please confirm whether the surrounding land uses have a potential for contaminant and/or any potential to cause contamination in, on or under the subject site.

Section 2.5 - Site Inspection

Please confirm which potential contaminant sources where inspected during the site walkover and how these were identified.

Please confirm if any samples were obtained from the soil and vegetation piles observed in the northern part of the site and if so which analytes were tested. Please confirm whether or not any asbestos containing building materials were observed in the building or structures on the central eastern boundary or elsewhere on the site.

Based on the site history (interviews) please comment on the likelihood of residual pesticide/herbicide contamination still existing on the site bearing in mind the degradation rates of the compounds known or likely to have been involved. Please also comment on what these were, or if not known justify the range of analytical testing undertaken.

From the description provided by Mr Henning Olsen it would appear that the site was operated as an orchard for at least some of the period between 1982 and 2004 – this appears to be borne out by the aerial photograph for 1990. Please comment accordingly, specifically in relation to the sampling program undertaken.

Section 3 – Site History

The auditor considers that the 1990 photo shows rows of trees in an orchard like configuration, please comment on the implications in terms of sampling design.

Generally the likely contaminants are agreed with pesticides and herbicides being the most likely, however, the distribution by spraying, or other forms of application or broadcasting would likely result in the contamination of surface or near surface soils - which do not appear to have been analysed according to the COCD and laboratory report from Eurofins MGT. Please comment accordingly and/or justify the sampling and analysis regime adopted.

Section 4 – Geo-environmental Setting

No specific comments on this section. However there appears to be a considerable potential range in the reported groundwater levels beneath and/or adjacent to the site. Can Coffey please explain why this is so and comment on the potential for contamination of groundwater arising from the subject site?

Section 5 - Conceptual Site Model

Based on the sampling program undertaken particularly (depth of sampling and analysis) and the absence of any materials logged as filling (including stockpiles) then the auditor considers that contamination arising from the potential sources (of contamination) identified in the CSM would not necessarily have been verified.

The auditor also notes that in Table D all three potential sources of contamination are described as being potentially present over the entire site, but this is not reflected in the adopted sampling design. Moreover, direct contact, ingestion and particulate inhalation and root uptake are specified as potential exposure routes, suggesting that surface/near surface sampling and analysis should have been undertaken, but apparently wasn't. Please comment accordingly and justify the adopted sampling design against the CSM and the plausible exposure pathways.

Section 6 – Field Work

Coffey indicate that the 10 test pits excavated comprised targeted (focused) sampling locations. Please confirm what specific contaminant sources were targeted and confirm how this complies with the required minimum sampling density for a site of 1.4 ha on the basis that grid (random) sampling should also have been undertaken in addition to the target (focused) sampling.

In addition Coffey state that samples were collected at the surface (as noted on the logs and in correspondence with the laboratory), but no surface samples were apparently analysed (according to the COCD and laboratory certificates). Please comment and justify the sample selection process and in particular justify the depth (vertical) and horizontal sampling frequency adopted.

Ground conditions are described in this section, but filling is noted elsewhere in the report. Please explain why apparently no samples of filling were obtained, analysed or logged.

Section 7 – Analytical Results

It appears that a second laboratory was not employed as would normally be required. Please confirm and explain why this does not compromise the overall data set in terms of PARCC principles.

The analytical frequency, either vertically or laterally, is not explained in the report. Please justify why only certain samples were analysed for the analytical suites adopted, e.g. TRH fractions were only analysed for the 0.5 m depth samples, but not for other depths, whereas metals were analysed from the 1.0m depth samples and pesticides and herbicides were analysed from 0.5 m and 2.0m depths without justification. Surely, in this regard, pesticide and herbicides if present would be concentrated in the surface and near surface soils, even allowing for some churning from vehicle movements etc. Similarly, metals and hydrocarbons might reasonably have been located in surface soils or perhaps deeper in the case of hydrocarbons. Please therefore confirm the adopted sampling and analytical rationale by reference to the likely contaminant laydown mechanisms.

Please also comment on why soil pH and CEC were not analysed. Please also justify why the surface samples (0 - 0.2 m) for all test pits (as submitted to Eurofins MGT - see email dated 3 October 2013) were not apparently analysed (and simply put on hold) as surely these samples would have been amongst the most relevant in terms of properly characterizing the site, and in particular bearing in mind the likely contaminant laydown mechanisms for the principal contaminants of concern.

Based on the analytical results there appear to be some elevated levels of metals (e.g. barium, chromium, arsenic, vanadium) which may be above background levels [although some of these samples were obtained at depths of 1.0 - 2.0 m depth]. Please comment on their likely origin if not background concentrations.

Section 8 – Quality of Analytical Data

Please justify the absence of second laboratory samples (triplicates) in terms of achieving normal data quality objectives (see earlier).

RPDs for inorganics are normally 30%, not 50% as indicated in the report. In this regard NEPM 2013 - B3, Sections 3.5.1 and 3.5.2, states 30% for laboratory and field replicates, whilst AS 4482.1-2005 states 30%-50% for laboratory and field replicates, with variation expected to be higher for organics than inorganics and for low concentrations. Coffey appear to be at odds with NEPM 2013 in this regard. Please comment accordingly.

Section 9 – Refined CSM

Whilst the PSI and site inspection in all probability verified that the risk of contamination was low on this site, it is not feasible in the auditor's opinion to conclude that there are no remaining issues, nor that contaminated source materials are absent - particularly noting that (i) the lateral sampling density was insufficient to adequately characterize the site, and (ii) that the vertical sampling and analytical interval does not apparently match the most likely contaminant distribution pattern [the laydown mechanism which could have arisen from spraying or other forms of pesticide or herbicide application, or any potential contamination from equipment, machinery or filling]. Accordingly on the basis of the

information to date the auditor considers that it is similarly not feasible to conclude that there are no (remaining) complete exposure pathways on the site. Please comment accordingly.

Section 10 - Conclusions

As noted above, the auditor does not agree that the identified contaminant sources have been adequately assessed.

The auditor notes that groundwater assessment was not undertaken as part of the approved scope of works undertaken by Coffey. However, can Coffey please indicate whether they consider that a groundwater assessment is required, or not, and state why (noting that this issue would be better addressed following completion of a full DSI)?

The auditor agrees that the maximum levels of contamination on the site may not have been encountered but notes that whilst the investigations to date have not revealed any potential issues, this conclusion by Coffey is based upon a limited sampling and analytical regime which may well be inadequate both laterally and vertically.

Accordingly, the auditor does not agree that sufficient investigations have been undertaken to conclude that the site is suitable for the proposed land use and/or that there are no unacceptable risks to human health and the environment. The auditor therefore considers that further sampling and testing is required to better and more adequately characterize the site such that it can then be reasonably concluded that the site is, or can be made, suitable for the proposed land use.

Appendix D 'Drilling' Logs

Drilling logs are presented in the title of the appendix but the testing was via backhoe (test pits) and no drilling appears to have been undertaken - please clarify.

Filling is mentioned in the report (mounds) but is not represented in any of the test pit logs. Please comment and explain why (apparently) no samples of filling were obtained and tested.

Appendix E Chain of Custody Documentation

The auditor notes that samples for analysis were obtained from 0.5 m, 1.0 m and in some cases 2.0 m depth and that further samples not on the COCD were apparently placed on hold including those from 0 - 0.2 m from all test pits and from other depths from various locations.

The nature of the likely contamination from nursery applications of pesticides and herbicides (and probably other contaminants from machinery and filling) would however suggest that the shallow soil profile would be the most likely horizon for the laydown or accumulation of contaminants and not the 0.5 m, 1.0 m and 2.0 m soil depth horizons which were analysed.

However, from the laboratory reports from Eurofins MGT (**Appendix F**) it appears that only those samples listed on the COCD form, dated 3 October 2013, were actually tested i.e. the surface to shallow samples 0-0.2m from each test pit were not tested. Please confirm and justify.

Accordingly the auditor does not consider that the adopted sampling and analytical regime is likely to be representative of the most likely zone of impact from contaminants potentially present on the site and that the analysis of the 0.5 m, 1.0 m and 2.0 m depth horizons could have resulted in a misrepresentation of the (vertical) degree and/or extent of potential contamination.

No evidence of a second laboratory undertaking split duplicate analysis (triplicate), please advise why a second laboratory was not employed.

Concluding Summary

In the auditor's view the site has not been adequately assessed either vertically (as above) or horizontally i.e. as per earlier comments regarding (lateral) sampling density.

It is therefore suggested that surficial samples are analysed (if these have been retained by the laboratory and remain within their use by dates) and in any event that additional sampling should be undertaken in order to sufficiently characterize the site.

I therefore suggest that Coffey provide a suitable SAQP with this in mind. I understand that NT EPA may have the same overall opinion.

Please contact the undersigned if you have any questions on these comments.

Douglas Partners Pty Ltd

J M Nash
Principal

Please note that the above information, interim advice and opinions do not pre-empt the eventual site audit findings nor do they constitute a site audit as defined under Part 4 of the Contaminated Land Management Act, 1997, or as defined by NT EPA in adopting the NSW scheme..

NORTHERN TERRITORY OF AUSTRALIA

Planning Act - sections 54 and 55

DEVELOPMENT PERMIT

DP12/0309

DESCRIPTION OF LAND THE SUBJECT OF THE PERMIT

Section 05694

Hundred of Bagot

41 BOULTER RD, BERRIMAH

APPROVED PURPOSE

To use and develop the land for the purpose of 34 x 1 bedroom and 5 x 2 bedroom multiple dwellings in 39 single storey buildings, to be constructed in three stages, for a period of 12 years, in accordance with the attached schedule of conditions and the endorsed plans.

VARIATIONS GRANTED

Nil.

BASE PERIOD OF THE PERMIT

Subject to the provisions of sections 58, 59 and 59A of the Planning Act, this permit will lapse two years from the date of issue.

HANNA STEVESON
Delegate
Development Consent Authority

22/06/2012

DEVELOPMENT PERMIT

DP12/0309

SCHEDULE OF CONDITIONS

CONDITIONS PRECEDENT

1. Prior to commencement of works (including site preparation) and prior to the endorsement of plans, the applicant is to prepare a schematic plan demonstrating all stormwater can be collected on the site and discharged to Council's stormwater drainage system, to the requirements of City of Darwin, to the satisfaction of the consent authority.

2. Prior to commencement of works (including site preparation) and prior to the endorsement of plans, the applicant is to prepare a landscaping plan for the site generally that includes specific details for the area fronting Boulter Road and the park at the northern end of the internal roadway. This is to include a planting schedule specifying plant species, quantities, pot sizes and size at maturity for all plants to be provided on site, and is to provide shade and be largely comprised of native vegetation, as per subclause 4(c) of the Berrimah North Planning Principles. This plan is to be to the satisfaction of the consent authority and is to be endorsed by this permit.

3. Prior to the endorsement of plans and prior to the commencement of works (including site preparation) a full set of amended plans must be submitted to, and approved by, the consent authority. When approved, the plans will be endorsed and will then form part of the permit. The plans must be drawn to scale with dimensions must be provided, and be generally in accordance with the plans submitted with the application but modified to show:

   a) future legal and physical access through the subject site to the road reserve area at the rear of the site to the requirements of Land Administration Division of the Department of Lands and Planning;

   b) a minimum of a 6m setback to Boulter Road;

   c) a minimum of a 6m setback to the proposed road reserve along the rear property boundary; and

   d) clear delineation of the staging of the development.

4. Prior to commencement of works (including site preparation) and prior to the endorsement of plans, a contaminated site assessment shall be prepared to the satisfaction of the Department of Natural Resources, Environment, the Arts and Sport (NRETAS) confirming that the site is suitable for the proposed use, to the satisfaction of the consent authority.

GENERAL CONDITIONS

5. Works carried out under this permit shall be in accordance the plans endorsed as forming part of this permit.

6. Prior to commencement of use, a waste management plan addressing the City of Darwin's Waste Management Policy 054 must be prepared to the requirements of the City of Darwin and to the satisfaction of the consent authority.

7. Before the use commences the developer/ owner must pay a monetary contribution in accordance with the City of Darwin's Berrimah North Contribution Plan, to assist in upgrading infrastructure in the area, to the satisfaction of the consent authority.

8. The approved use will cease 12 years from the date on which the development permit is signed, and any further use of the site for the purposes of a multiple dwelling development will require additional development consent. All buildings are to be removed by the date 12 years from the signing of this permit.

9. An Occupancy Permit under the Building Act must not be issued or occupation of the development commence until Section 5694, Hundred of Bagot has been subdivided to create a new parcel for the proposed road reserve and this has been reverted to Crown Land under the management of Administration Division of the Department of Lands and Planning.

10. Any developments on or adjacent to any easements on site shall be carried out to the requirements of the relevant service authority to the satisfaction of the consent authority.

11. The owner of the land must enter into agreements with the relevant authorities for the provision of water supply, drainage, sewerage facilities and electricity and telecommunications services to the land shown on the endorsed plan in accordance with the authorities' requirements.

12. Stormwater is to be collected and discharged into the drainage network to the technical standards of and at no cost to the Council, to the satisfaction of the consent authority.

13. The kerb crossovers and driveways to the site approved by this permit are to meet the technical standards of, and be at no cost to the City of Darwin, to the satisfaction of the consent authority.

14. The owner shall:

a) remove disused vehicle and/ or pedestrian crossovers;

b) provide footpaths/ cycleways;

c) collect stormwater and discharge it to the drainage network; and

d) undertake reinstatement works;

All to the technical requirements of, and at no cost to, the City of Darwin, and to the satisfaction of the consent authority.

15. Before the use or occupation of the development starts, the areas set-aside for the parking of vehicles and access lanes as shown on the endorsed plans must be:

a) constructed;

b) properly formed to such levels that they can be used in accordance with the plans;

c) surfaced with an all-weather-seal coat; and

d) drained; to the satisfaction of the consent authority.

Car spaces, access lanes and driveways must be kept available for these purposes at all times.

16. No fence, hedge, tree or other obstruction exceeding a height of 0.6m is to be planted or erected so that it would obscure sight lines at the junction of the driveway and the public street.

17. Before the use/ occupation of the development starts, the landscaping works shown on the endorsed plans must be carried out and completed to the satisfaction of the consent authority.

18. The landscaping shown on the endorsed plans must be maintained to the satisfaction of the consent authority, including that any dead, diseased or damaged plants are to be replaced.

19. All air-conditioning condensers are to be appropriately screened from public view, located so as to minimise thermal and acoustic impacts on neighbouring properties and condensate disposed to ground level in a controlled manner to the satisfaction of the consent authority.

20. All balconies are to be internally drained and discharge is to be disposed of at ground level and in a manner consistent with stormwater disposal arrangements for the site to the satisfaction of the consent authority.

21. Storage for waste disposal bins is to be provided to the requirements of the City of Darwin, to the satisfaction of the consent authority.

22. Any lighting installed as part of the development is to consider section 9.21 'Lighting in the Vicinity of Aerodromes' of the CASA Manual of Standards Part 139, available at: http://www.casa.gov.au/wcmswr/assets/main/rules/1998casr/139/139mfull.pdf.

NOTES

1. The developer is to contact Telstra via the following website prior to any work commencing to facilitate the installation of the Telstra network: http://www.telstrasmartcommunity.com/, and is to register the development with NBN Co at http://www.nbnco.com.au/getting-connected/new-developments.html.

2. Telstra advises that the developer is required to contact 'Dial Before You Dig' on 1100 to obtain a location of the Telstra network, and arrange for any removal or relocation if required.

3. The Power and Water Corporation advises that the Water and Sewer Services Development Section (landdevelopmentnorth@powerwater.com.au) and the Power Network Engineering Section (powerconnections@powerwater.com.au) should be contacted via email a minimum of 1 month prior to construction works commencing in order to determine the servicing requirements of the Corporation, and the need for upgrading of on-site and/or surrounding infrastructure.

4. The City of Darwin advises that, notwithstanding the approved plans, any proposed awnings, footpaths and landscaping works within Council's road reserve are subject to approval from the City of Darwin, and shall be undertaken at no cost to Council.

5. The Department of Natural Resources, Environment, The Arts and Sport (NRETAS) advises that construction work should be conducted in accordance with the NRETAS Noise guidelines for development sites. The guidelines specify that on-site construction activities are restricted to between 7am and 7pm Monday to Saturday and 9am to 6pm Sunday and Public Holidays. For construction activities outside these hours refer to the guidelines for further information.

Appendix D

Survey Plan

Appendix E

Test Bore Logs

coffey

Drilling Log

Soil Boring **S01**

Page: 1 of 1

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure). Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Grey brown, fine grained sand, small-medium angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Light brown-brown and orange, fine grained sand, low plasticity
						S01 terminated at 0.25mbgs as requried
1						

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coffey

Drilling Log

Soil Boring **S02**

Page: 1 of 1

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	C)-0.1			GP	Sandy GRAVEL: Brown, fine grained sand, small-medium angular gravels, dry
	0.0	C).15-0.25			CL	Sandy CLAY: Light brown-brown and orange, fine grained sand, low plasticity, trace gravels
						S02 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S03**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Brown, fine grained sand, small angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Brown-dark brown and orange, fine grained sand, low plasticity
						S03 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S04**

Page: 1 of 1

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Brown, fine grained sand, small angular gravels, dry
	0.0	0.15-0.25			CL	Clayey SAND: Brown-dark brown and orange, fine grained sand, low plasticity
						S04 terminated at 0.25mbgs as requried
1						

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Drilling Log

Soil Boring **S05**

Page: 1 of 1

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Grey-brown, fine grained sand, small-medium angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Brown-light brown, fine grained sand, low plasticity
						S05 terminated at 0.25mbgs as requried
1						

COFFEY ENVIRONMENTS Rev: 16/7/13 ENAUKESW01228AC-LOGS.GPJ IT_CORP.GDT 2/4/14

coffey

Drilling Log

Soil Boring **S06**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure). Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Grey to dark brown, fine grained sand, small-medium angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Grey to dark brown and orange, fine grained sand, low plasticity
						S06 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S07**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Brown, fine grained sand, small angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Brown, grey and orange, fine grained sand, low plasticity
						S07 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S08**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Grey-brown, fine grained sand, small angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Brown, grey and orange, fine grained sand, low plasticity
						S08 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S09**

Page: 1 of 1

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Dark brown, fine grained sand, small angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Dark brown and orange, fine grained sand, low plasticity
						S09 terminated at 0.25mbgs as requried
1						

COFFEY ENVIRONMENTS Rev: 16/7/13 ENAUKESW01228AC-LOGS.GPJ IT_CORP.GDT 2/4/14

coffey

Drilling Log

Soil Boring **S10**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Dark brown, fine grained sand, small angular gravels, dry
	0.0	0.15-0_25			CL	Sandy CLAY: Dark brown and orange, fine grained sand, low plasticity, trace gravels
						S10 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S11**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Brown-grey, fine grained sand, small angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Light brown to brown, fine grained sand, low plasticity
						S11 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S12**

Page: 1 of 1

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure). Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Brown-grey, fine grained sand, small angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Light brown to brown orange, fine grained sand, low plasticity
						S12 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S13**

Page: 1 of 1

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.1	0-0.1			GP	Sandy GRAVEL: Brown-dark brown, fine grained sand, small angular gravels, dry
	0.1	0.15-0.25			CL	Sandy CLAY: Light brown to brown, fine grained sand, low plasticity
						S13 terminated at 0.25mbgs as requried
1						

COFFEY ENVIRONMENTS Rev: 16/7/13 ENAUKESW01228AC-LOGS.GPJ IT_CORP.GDT 2/4/14

coffey

Drilling Log

Soil Boring **S14**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery / Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0					
	0.1	0-0.1		GP	Sandy GRAVEL: Brown-grey, fine grained sand, small angular gravels, dry
	0.1	0.15-0.25		CL	Sandy CLAY: Light brown to brown orange, fine grained sand, low plasticity
					S14 terminated at 0.25mbgs as requried
1					

coffey

Drilling Log

Soil Boring **S15**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.1	0-0.1			GP	Sandy GRAVEL: Brown-grey, fine grained sand, small angular gravels, dry
	0.1	0.15-0.25			CL	Snady CLAY: Light brown to brown orange, fine grained sand, low plasticity
						S15 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S16**

Page: 1 of 1

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0	0.0	0-0.1			GP	Sandy GRAVEL: Brown-grey, fine grained sand, small rounded gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Light brown to brown, fine grained sand, low plasticity
						S16 terminated at 0.25mbgs as requried
1						

COFFEY ENVIRONMENTS Rev: 16/7/13 ENAUKESW01228AC-LOGS.GPJ IT_CORP.GDT 2/4/14

coffey

Drilling Log

Soil Boring **S17**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Brown-grey, fine grained sand, small-medium angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Light brown to brown orange, fine grained sand, low plasticity
						S17 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S18**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.1	0-0.1			GP	Sandy GRAVEL: Brown-grey, fine grained sand, small rounded gravels, dry
	0.1	0.15-0.25			CL	Sandy CLAY: Light brown to brown orange, fine grained sand, low plasticity
						S18 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S19**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Brown-grey, fine grained sand, small angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Brown to brown orange, fine grained sand, low plasticity
						S19 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S20**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.1	0-0.1			GP	Sandy GRAVEL: Light brown-grey, fine grained sand, small angular gravels, dry
	0.1	0.15-0.25			CL	Sandy CLAY: Brown to brown orange, fine grained sand, low plasticity
						S20 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S21**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Light brown, fine grained sand, small angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Brown to dark brown, fine grained sand, low plasticity
						S21 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S22**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.1	0-0.1			GP	Sandy GRAVEL: Light brown, fine grained sand, small angular gravels, dry
	0.1	0.15-0.25			CL	Sandy CLAY: Brown to dark brown, fine grained sand, low plasticity
						S22 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S23**

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure). Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Light brown-grey, fine grained sand, small angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Brown grey, fine grained sand, low plasticity
						S23 terminated at 0.25mbgs as requried
1						

coffey

Drilling Log

Soil Boring **S24**

Page: 1 of 1

Project *LJ Superfund - Berrimah NT* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AC*

Surface Elev. *NA* Total Hole Depth *0.3 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *150 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with soil cuttings* Rig/Core *Shovel*

Drill Co. *NA* Method *Shovel*

Driller *NA* Log By *Corinne Hutchinson* Date *19/3/14* Permit # *NA*

Checked By *FM* License No.

COMMENTS

Depth (m.)	PID (ppm)	Sample ID % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.1			GP	Sandy GRAVEL: Light brown-grey, fine grained sand, small-medium angular gravels, dry
	0.0	0.15-0.25			CL	Sandy CLAY: Brown grey, fine grained sand, low plasticity
						S24 terminated at 0.25mbgs as requried
1						

COFFEY ENVIRONMENTS Rev: 16/7/13 ENAUKESW01228AC-LOGS.GPJ IT_CORP.GDT 2/4/14

coffey

Drilling Log

Test Pit **TP1**

Project *Boulter Road - Site Contamination Assessment* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *500 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with designated soil returns* Rig/Core *Excavator*

Drill Co. *Arafura Plant Hire* Method *Excavation*

Driller *Jason* Log By *CH* Date *2/10/13* Permit # *NA*

Checked By *FM* License No. *NA*

COMMENTS
GPS coordinates:
12 25.036'
130 54.908'

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.2			GP	Silty, sandy GRAVEL: Brown/grey, fine rounded gravels, dry
	0.0	0.5			CL	Sandy, gravelly CLAY: Light brown/orange, medium rounded gravels, dry
1	0.0	1.0				
					GP	Sandy GRAVEL: Red/grey mottled orange, coffee rock present, dry
2	0.0	2.0				TP1 terminated at 2.0mbgs as required
3						

COFFEY ENVIRONMENTS Rev: 16/7/13 ENAUKESW01228AA-LOGS.GPJ IT_CORP.GDT 16/10/13

coffey

Drilling Log

Test Pit **TP2**

Project *Boulter Road - Site Contamination Assessment* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *500 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with designated soil returns* Rig/Core *Excavator*

Drill Co. *Arafura Plant Hire* Method *Excavation*

Driller *Jason* Log By *CH* Date *2/10/13* Permit # *NA*

Checked By *FM* License No. *NA*

COMMENTS
GPS coordinates:
12 25.041'
130 54.925'

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.2			GP	Silty, sandy GRAVEL: Brown/grey, fine rounded gravels, dry
	0.0	0.5			CL	Sandy, gravelly CLAY: Brown/orange/grey, fine-medium subangular gravels, dry
1	0.0	1.0			CL	Sandy CLAY: Red/yellow/brown, dry
					GP	Sandy clayey GRAVEL: Red/grey/brown, fine rounded gravels, dry
2	0.0	2.0				TP2 terminated at 2.0mbgs as required
3						

Drilling Log

Test Pit **TP3**

Project *Boulter Road - Site Contamination Assessment* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *500 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with designated soil returns* Rig/Core *Excavator*

Drill Co. *Arafura Plant Hire* Method *Excavation*

Driller *Jason* Log By *CH* Date *2/10/13* Permit # *NA*

Checked By *FM* License No. *NA*

COMMENTS
GPS coordinates:
12 25.022'
130 54.915'

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0	0.0	0-0.2			GP	Silty, sandy GRAVEL: Brown to light brown, fine angular gravels, dry
	0.0	0.5			CL	Sandy, gravelly CLAY: Light brown, orange grey mottled, finerounded gravels, dry
1	0.0	1.0				
					CL	Gravelly, sandy CLAY: Red/brown, coffee rock present, dry
2	0.0	2				TP3 terminated at 2.0mbgs as required
3						

coffey

Drilling Log

Test Pit **TP4**

Project *Boulter Road - Site Contamination Assessment* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *500 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with designated soil returns* Rig/Core *Excavator*

Drill Co. *Arafura Plant Hire* Method *Excavation*

Driller *Jason* Log By *CH* Date *2/10/13* Permit # *NA*

Checked By *FM* License No. *NA*

COMMENTS
GPS coordinates:
12 25.024'
130 54.933'

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.2			GP	Silty, sandy GRAVEL: Brown/grey, fine-medium rounded gravels, dry
	0.0	0.5			CL	Sandy, gravelly CLAY: Brown/orange/grey, fine-medium subangular gravels, dry
1	0.0	1.0			CL	Sandy CLAY: Brown/red/orange, weathered coffee rock
2	0.0	2				TP4 terminated at 2.0mbgs as required
3						

coffey

Drilling Log

Test Pit **TP5**

Project *Boulter Road - Site Contamination Assessment* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *500 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with designated soil returns* Rig/Core *Excavator*

Drill Co. *Arafura Plant Hire* Method *Excavation*

Driller *Jason* Log By *CH* Date *2/10/13* Permit # *NA*

Checked By *FM* License No. *NA*

COMMENTS
GPS coordinates:
12 24.999'
130 54.923'

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.2			GP	Silty, sandy GRAVEL: Brown/grey, fine rounded gravels, dry
	0.0	0.5			CL	Sandy, gravelly CLAY: Light brown/red orange mottled, fine subangular gravels, weathered coffee rock
1	0.0	1.0			CL	Sandy CLAY: Red/yellow mottled grey, weathered coffee rock, dry
2	0.0	2				TP5 terminated at 2.0mbgs as required
3						

coffey

Drilling Log

Test Pit **TP6**

Project *Boulter Road - Site Contamination Assessment* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *500 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with designated soil returns* Rig/Core *Excavator*

Drill Co. *Arafura Plant Hire* Method *Excavation*

Driller *Jason* Log By *CH* Date *2/10/13* Permit # *NA*

Checked By *FM* License No. *NA*

COMMENTS
GPS coordinates:
12 25.004'
130 54.938'

Depth (m.)	PID (ppm)	Sample ID / % Recovery / Blow Count / Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0					
	0.0	0-0.2		GP	Silty, sandy GRAVEL: Brown/grey, fine rounded gravels, dry
	0.0	0.5		SP	Gravelly SAND: Brown/grey, fine to coarse rounded and subangular gravels, dry
1	0.0	1.0		SP SC	Clayey, gravelly SAND: brown/red/grey, low plasticity
				CL	Sandy CLAY: Brown/red mottled grey, weathered coffee rock
2	0.0	2			TP6 terminated at 2.0mbgs as required
3					

coffey

Drilling Log

Test Pit **TP7**

Project *Boulter Road - Site Contamination Assessment* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *500 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with designated soil returns* Rig/Core *Excavator*

Drill Co. *Arafura Plant Hire* Method *Excavation*

Driller *Jason* Log By *CH* Date *2/10/13* Permit # *NA*

Checked By *FM* License No. *NA*

COMMENTS
GPS coordinates:
12 24.971'
130 54.944'

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.2			GP	Silty, sandy GRAVEL: Brown/grey, fine rounded gravels, dry
	0.0	0.5			CL	Sandy, silty CLAY: Brown/orange mottled red, weathered coffee rock, dry
1	0.0	1.0			CL	Sandy CLAY: Red/brown mottled grey, weathered coffee rock, dry
2	0.0	2				TP7 terminated at 2.0mbgs as required
3						

coffey

Drilling Log

Test Pit **TP8**

Project *Boulter Road - Site Contamination Assessment* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *500 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with designated soil returns* Rig/Core *Excavator*

Drill Co. *Arafura Plant Hire* Method *Excavation*

Driller *Jason* Log By *CH* Date *2/10/13* Permit # *NA*

Checked By *FM* License No. *NA*

COMMENTS
GPS coordinates:
12 24.992'
130 54.956'

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.2			GP	Silty, sandy GRAVEL: Brown/grey, fine rounded gravels, dry
	0.0	0.5			CL	Sandy, CLAY: Red/brown/orange, weathered coffee rock, dry
1	0.0	1.0				
					SP SC	Gravelly, clayey SAND: Red/orange/brown, fine-medium subangular gravels, dry
2	0.0	2				TP8 terminated at 2.0mbgs as required
3						

Drilling Log

Test Pit **TP9**

Project *Boulter Road - Site Contamination Assessment* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *500 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with designated soil returns* Rig/Core *Excavator*

Drill Co. *Arafura Plant Hire* Method *Excavation*

Driller *Jason* Log By *CH* Date *2/10/13* Permit # *NA*

Checked By *FM* License No. *NA*

COMMENTS
GPS coordinates:
12 24.940'
130 54.962'

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.2			GP	Silty, sandy GRAVEL: Brown/grey, fine rounded gravels, dry
	0.0	0.5				Sandy, CLAY: Red/orange, weathered coffee rock, dry
1	0.0	1.0			CL	
					CL	Gravelly, sandy CLAY: Red/grey, fine-medium rounded gravels, low plasticity
2	0.0	2				TP9 terminated at 2.0mbgs as required
3						

coffey

Drilling Log

Test Pit **TP10**

Project *Boulter Road - Site Contamination Assessment* Owner *LJ Superfund*

Location *41 Boulter Road, Berrimah, NT* Proj. No. *ENAUKESW01228AA*

Surface Elev. *NA* Total Hole Depth *2.0 m.* North *NA* East *NA*

Top of Casing *NA* Water Level Initial *NA* Static *NA* Diameter *500 mm.*

Screen: Dia *NA* Length *NA* Type/Size *NA*

Casing: Dia *NA* Length *NA* Type *NA*

Fill Material *Backfilled with designated soil returns* Rig/Core *Excavator*

Drill Co. *Arafura Plant Hire* Method *Excavation*

Driller *Jason* Log By *CH* Date *2/10/13* Permit # *NA*

Checked By *FM* License No. *NA*

COMMENTS
GPS coordinates:
12 24.966
130 54.974'

Depth (m.)	PID (ppm)	Sample ID / % Recovery	Blow Count Recovery	Graphic Log	USCS Class.	Description (Color, Texture, Structure) — Geologic descriptions are based on ASTM Standard D 2487-93 and the USCS.
0						
	0.0	0-0.2			GP	Silty, sandy GRAVEL: Brown/grey, dry
	0.0	0.5			CL	Sandy, CLAY: Red brown/grey, dry
1	0.0	1.0				
					SW	Gravelly, clayey SAND: Red/brown, fine-medium subangular gravels, dry
2	0.0	2				TP10 terminated at 2.0mbgs as required
3						

Appendix F

Summary of Analytical Results

Appendix G

Quality Control Information

4 Data Quality Objectives and Data Quality Indicators

4.1 Data Quality Objectives

As stated in Section 18 (Appendix B) of Schedule B(2) 'Guideline on Site Characterisation' of the ASC NEPM of the amended ASC NEPM (NEPC, 2013), the Data Quality Objective (DQO) process is used to "*define the type, quantity and quality of data needed to support decisions relating to the environmental condition of a site*".

The specific DQOs for this project are summarised in Table 4.1.

Table 4.1: Data Quality Objectives

DQO	Outcome
State the Problem	The primary objective of the SAQP is to provide additional data to suitably characterise the site for future residential land use. The main problems are: • How many additional surface sampling locations should be undertaken? • What sampling layout should be used to achieve the above objective? • What analytes should be tested?
Identify the Decision	Do the potential chemical substances pose a risk to human health and/or the environment?
Identify Inputs to the Decision	The inputs to the decisions are: • Site history; • Conceptual Site Model; • COPCs; and • Visual observations and field measurements.
Define the Study Boundaries	The study boundary is shown in Figure 2. The proposed sampling locations are shown in Figure 2.

Table 4.1: Data Quality Objectives (continued)

DQO	Outcome
Develop a Decision Rule	The decision statements are: *Health Investigation Levels (HILs)* Individual results are to be less than the HILs. Where individual concentrations are more than the HILs, then further assessment and/or management may be required. • Where the 95% upper confidence limit (UCL) of the arithmetic mean for a data set can be calculated, the 95% UCLs are to be less than the HILs / HSLs. • Where the 95% UCL is more than the HILs, then further assessment and/or management may be required. • The validity of the data set as a single population will be reviewed if individual results in the data set are to be greater than 250% of the assessment criteria, and the standard deviation of the data set greater than 50% of the assessment criteria. *Environmental Investigation Levels (EILs)* Data is to be compared directly to EILs. Where individual concentrations are more than the EILs, further assessment and/or management may be required.
Specify Limits on Decision Errors	The acceptable limit on decision errors is a 5% probability of a false negative (i.e. assessing that the average concentrations of COPC in are less than the assessment criteria when they are actually greater than the assessment criteria). Where data sets are sufficiently populated, the 95% UCL of the arithmetic mean will be used to calculate this probability and the 95% UCLs are to be less than the assessment criteria.
Optimise the Design for Obtaining Data	The design for obtaining data will generally meet or exceed requirements of ASC NEPM as amended (NEPC, 2013) *Schedule B(2) Guidelines on Site Characterisation.* Systematic sampling will be used as justified in Section 5.1.

4.2 Data Quality Indicators

The QA assessment addresses data completeness, comparability, representativeness, precision and accuracy based on field and laboratory considerations with Section 19 (Appendix C) of Schedule B(2) 'Guideline on Site Characterisation' of the amended ASC NEPM (NEPC, 2013).

The DQIs will be assessed as follows:

Table 4.2a: Completeness

Field Considerations	Details	Laboratory Considerations	Details
All surface samples collected (systematic pattern)	Samples will be collected as per Section 5.2	All analytes analysed according to the SAQP	Samples will be analysed as per Section 5.3
Standard Operating Procedures (SOPs) appropriate and complied with	Coffey SOPs will be implemented during fieldwork	Appropriate methods and limit of reporting (LORs).	Samples will be analysed by NATA accredited laboratories for the analyses to be performed and appropriate methods will be used. LORs will be less than assessment criteria where practicable. Where this is not practicable, the implications to the quality of the data will be assessed on a case by case basis
Experienced sampler(s)	Experienced Coffey scientist will conduct the sampling	Sample documentation complete	Chain of custody (COC) forms will be returned, signed and dated by laboratory. NATA endorsed laboratory certificates will be completed in accordance with the amended ASC NEPM (NEPC, 2013)

Table 4.2a: Completeness (continued)

Field Considerations	Details	Laboratory Considerations	Details
Documentation correct	Samples will be handled and transported under appropriate chain of custody (COC) forms. Sample Receipt Notifications from the laboratory will be reviewed to assess that samples were received cool and in good condition. Calibration certificates for field equipment will be provided on a daily basis	Sample holding times complied with	Samples will be analysed within holding times specified by the amended ASC NEPM (NEPC, 2013)

Table 4.2b: Comparability

Field Considerations	Details	Laboratory Considerations	Details
Same SOPs to be used on each occasion	-	Same sample analytical methods used	-
Experienced sampler(s)	-	Same sample LORs	-
Climatic conditions (temperature, rainfall, wind…)	Sampling will be completed in a single day. Climatic conditions are not expected to causes issues for comparability of data	Same laboratories	-
Same types of samples collected	-	Same units	-

Table 4.2c: Representativeness

Field considerations	Details	Laboratory considerations	Details
Appropriate media sampled according to sample plan	Samples will be collected as per Section 5.2	All samples analysed according to sample plan	Samples will be analysed as per Section 5.3
All media identified in sample plan	Samples will be collected as per Section 5.2	-	-

Table 4.2d: Precision

Field considerations	Details	Laboratory considerations	Details
SOPs appropriate and complied with	-	Analysis of: laboratory replicates	Laboratory replicates will be analysed in general accordance with the amended ASC NEPM
-	-	Analysis of: field replicates	Replicates will be analysed as per Section 5.3 RPDs will be calculated and compared to relevant acceptance criteria
-	-	Analysis of: laboratory-prepared volatile trip spikes	A laboratory prepared trip spike will be analysed for soil sampling. Results are to be assessed against the LOR.

Table 4.2e: Accuracy

Field considerations	Details	Laboratory considerations	Details
Rinsate blank	A rinsate blank will be prepared during soil sampling and analysed. Results are to be assessed against the LOR	Analysis of method blank	Method blanks will be analysed as per the amended ASC NEPM. Results to be compared to LOR
SOP appropriate and complied with	-	Analysis of field blanks	A laboratory prepared trip blank will be analysed for soil sampling. Results are to be assessed against the LOR
-	-	Analysis of matrix spike	Matrix spike will be analysed as per the amended ASC NEPM. Results to be within acceptable limits
-	-	Analysis of matrix spike duplicate	Matrix spikes will be analysed as per the amended ASC NEPM. Results to be within acceptable limits
-	-	Analysis of surrogate spike	Surrogates will be analysed as per the amended ASC NEPM. Results to be within acceptable limits
-	-	Analysis of laboratory control samples	Laboratory control samples will be analysed as per the amended ASC NEPM. Results to be within acceptable limits

Table 4.2e: Accuracy (continued)

Field considerations	Details	Laboratory considerations	Details
-	-	Analysis of laboratory-prepared spikes	One laboratory prepared trip spike will be analysed. Recovery results ware to be within acceptable ranges