

RICHARD WALKER
CONSULTING PROFESSIONAL ENGINEER
ENGINEERING SUSTAINABLE SOLUTIONS LTD

WAINUI BAY
TAKAKA RD1
NEW ZEALAND
TEL: (64)-3-5284751
FAX: (64)-35469170

7 November 2005

The Building Inspector
Marlborough District Council
PO Box 443
Blenheim

ONSITE WASTEWATER SYSTEM FOR COTTAGE ON LOT 13 DP 2465
AT HAKA HAKA BAY, PORT UNDERWOOD
ASSESSMENT OF EFFECTS ON THE ENVIRONMENT

DESCRIPTION OF PROPOSAL

The new effluent disposal system will replace a new greywater treatment system installed in March 2005 under Building Consent BC050208. The intention then was to have a composting toilet. The owners would now like to have a flush toilet.

Reference should be made to the report by Consulting Engineer Richard Walker dated 26.10.2005 attached to the Resource Consent application for a full description of the proposed onsite wastewater system and design calculations and references.

The location of the cottage and effluent disposal area are shown on a copy of the Site Plan of Effluent Disposal System, Drg No ESS 986/01A. The base map for this plan is the Site Plan prepared by Irving Jack Architects and a reduced copy of this plan is attached to this report.

The effluent disposal system will comprise a dual chamber septic tank with Zabel filter at the outlet and a single pass sand filter which will provide a high quality effluent prior to disposal via subsurface dripper beds with pressure compensating drip irrigation lines within the landscaped garden areas.

The new effluent disposal area, which will be subsurface dripper beds, will comprise most of the available land on the section which is not occupied by the house or driveway.

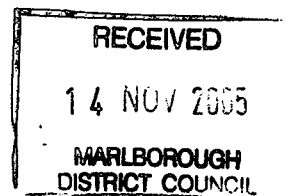
The cottage will be mainly used during the summer months with only occasional minor use during the winter.

The cottage has one bedroom and one small bunk room. The wastewater flow is estimated to be up to 600 litres per day for up to 4 people staying at the cottage.

A minimum distance of 2 metres between the edge of the subsurface dripper beds and all boundaries is proposed. The section has a very gentle slope of approximately 4 degrees towards the northeast corner of the section.

A subsurface cutoff drain will be provided upslope of the effluent disposal area to divert subsurface and surface water away from the irrigation area.

Southeast



ALTERNATIVE METHODS OF DISCHARGE

Alternative methods of effluent disposal were considered but the proposed system is considered to be the most suitable. Conventional soakage systems are not suitable due to the high groundwater levels during wet winter months and aerated wastewater treatment systems (AWTS) are considered not suitable due to the likely intermittent use of the cottage.

SURROUNDING ENVIRONMENT

The surrounding environment is rural residential with most of the adjacent properties being holiday homes being used mainly in the summer. The effluent disposal area is located well clear of any watercourses and the foreshore of Haka Haka Bay. The distance to the high water mark is approximately 50 metres.

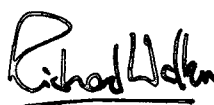
POSSIBLE NUISANCE EFFECTS

The possible nuisance effects will be negligible as the treatment system will provide a high quality effluent prior to disposal via pumped dose loading of subsurface dripper beds within landscaped garden areas. Reference to the literature indicates that the sand filter will produce an effluent with a faecal coliform concentration of less than 100 faecal coliforms per 100 millilitres.

MONITORING OF THE SYSTEM AND DISCHARGE

It is recommended that a site inspection be made by the Consulting Engineer Richard Walker, the Drainlayer Murray Warburton and the Building Inspector approximately one year after the system has been installed to check that it is functioning properly. If necessary a sample of the effluent can be taken at the pump chamber before disposal to the dripper beds.

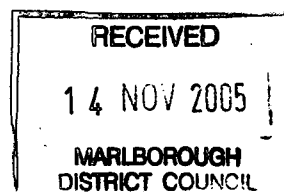
Yours faithfully

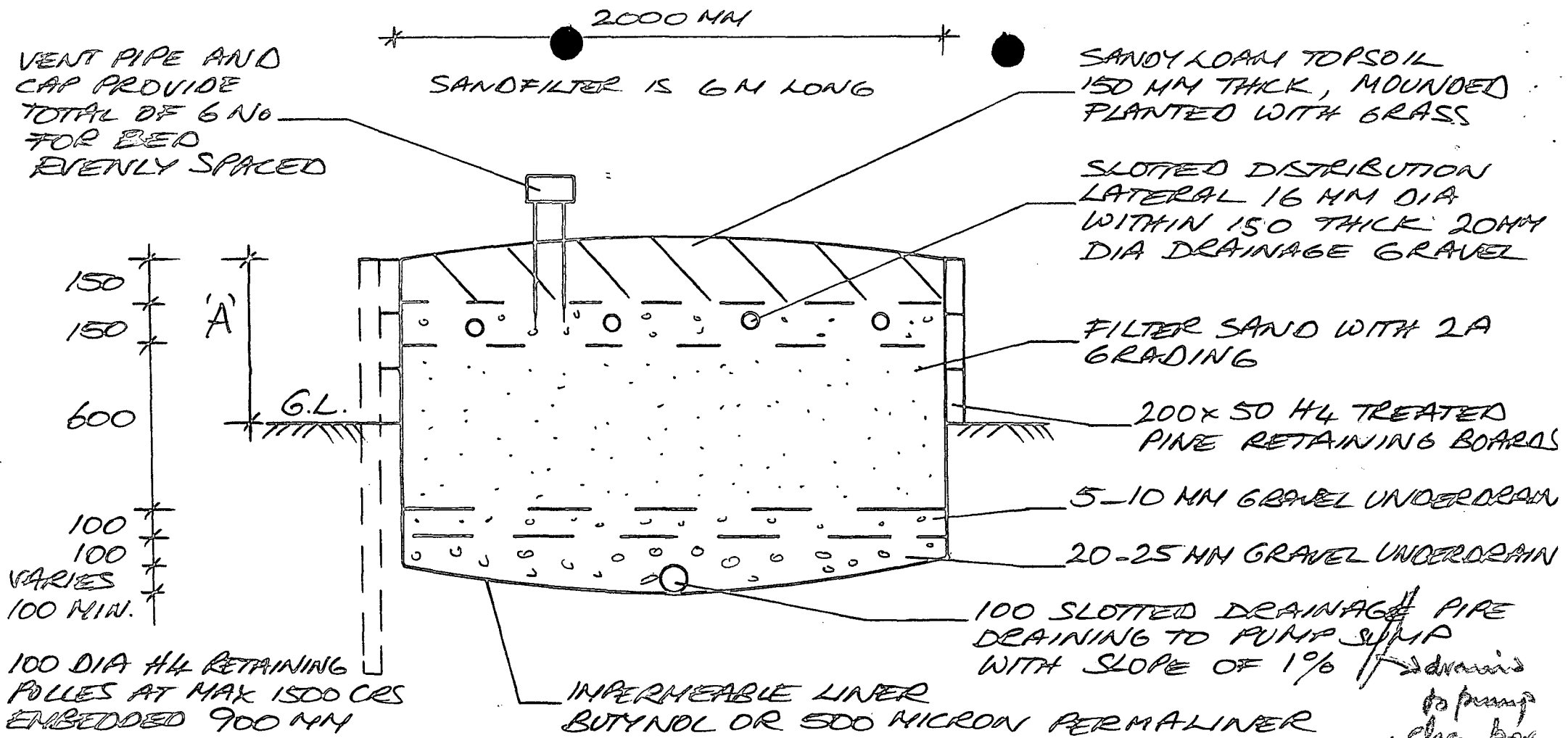


Richard Walker

cc T &H Parr (c/o Diane Cranfield)

Encl: Drg Nos ESS986/01A ,3 &4 and Site Plan by Irving Jack Architects





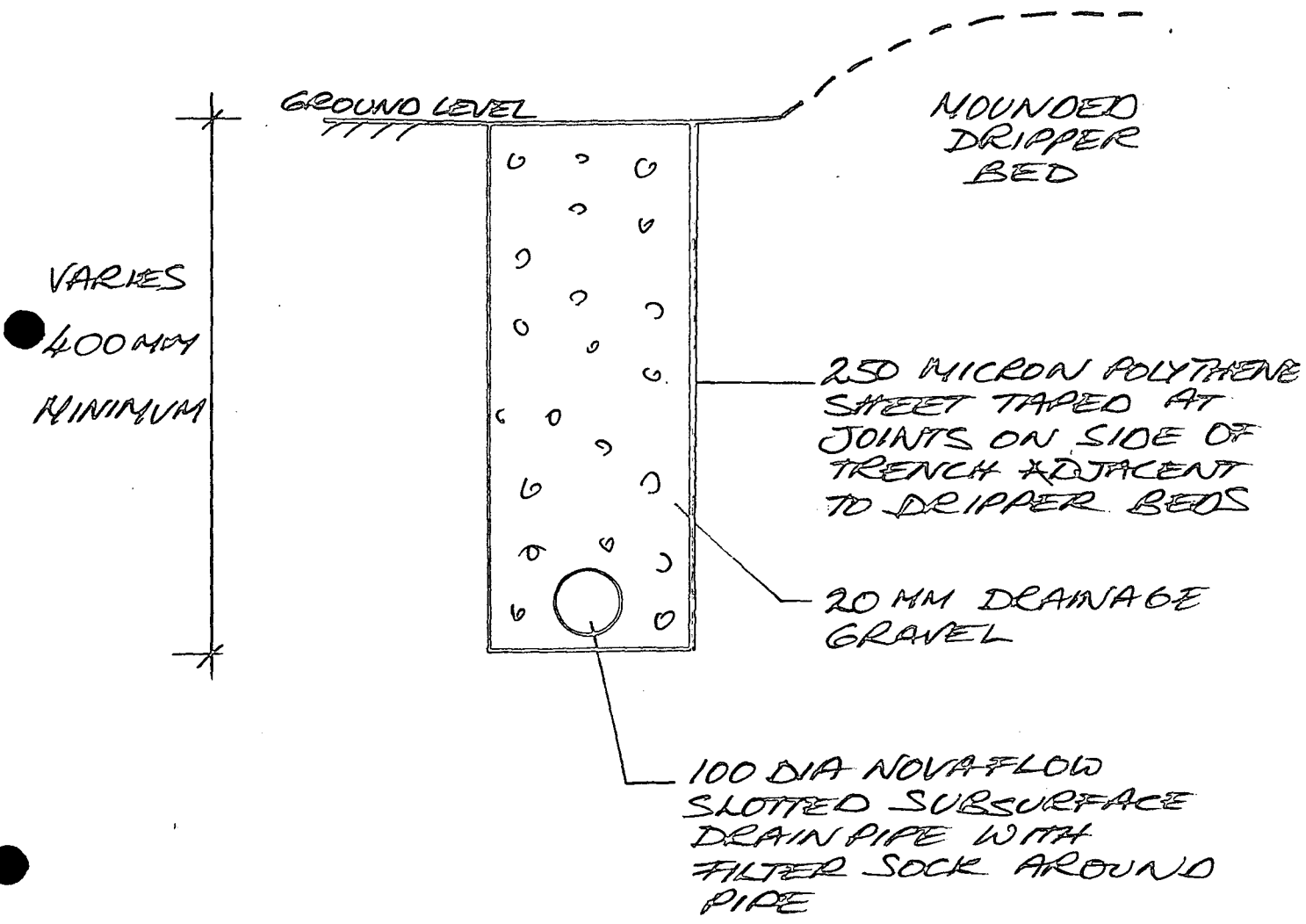
NOTES

1. REFER TO REPORT BY R.WALKER DATED 26.10.05.
2. DIMENSION 'A' THE HEIGHT OF TOPOF BED ABOVE GROUND LEVEL TO BE TYPICALLY 600 MM OR AS DETERMINED ON SITE BY DRAIN LAYER TO SUIT GROUND SLOPE AND SITE.

RECEIVED
14 NOV 2005
MARLBOROUGH
DISTRICT COUNCIL

TYPICAL CROSS-SECTION OF SINGLE PASS SAND FILTER FOR T&H PARR

SCALE: 1:20 (AT A4)
DATE: OCTOBER 2005
DRG No: ESS 986/03



NOTES

1. SUBSURFACE DRAIN TO HAVE MINIMUM GRADIENT OF 1.5% (1 IN 67)

SCALE 1:10 (AT ALL)

DATE: OCTOBER

DRG NO: ESS 986/04

TYPICAL CROSS-SECTION OF SUBSURFACE CUTOFF DRAIN

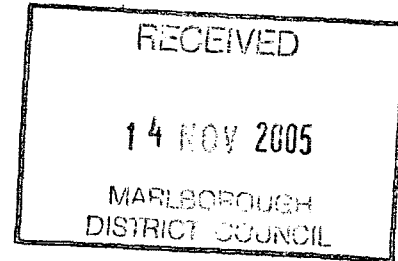
RECEIVED
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7 November 2005

Paul McLean
The Building Inspector
Marlborough District Council
PO Box 443
Blenheim



Dear Sir

ONSITE WASTEWATER SYSTEM FOR COTTAGE ON LOT 13 DP 2465
AT HAKA HAKA BAY, PORT UNDERWOOD

As discussed I enclose a Building Consent Application and Resource Consent Application for the Upgrade of the Onsite Wastewater System on Lot 13 at Haka Haka Bay for Tevor Parr.

Please could you try and arrange for the applications to be processed and approved as soon as is possible so that the Drainlayer can install the new system before mid December.

Please contact me if you have any queries or require any further information.

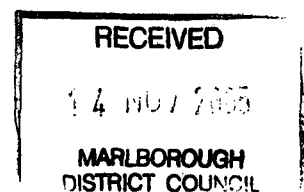
Thank you

Yours faithfully

A handwritten signature in black ink, appearing to read "Richard Walker".

Richard Walker

cc T &H Parr (c/o Diane Cranfield)
Drainlayer Murray Warburton



RICHARD WALKER
CONSULTING PROFESSIONAL ENGINEER
ENGINEERING SUSTAINABLE SOLUTIONS LTD

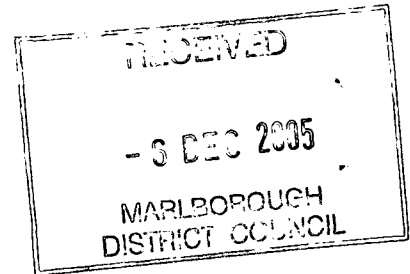
WAINUI BAY
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FAX

3 December 2005

Guy Boddington
Marlborough District Council
PO Box 443
Blenheim

*Additional
info from
Richard Walker*



Fax No 03-5786866

Dear Guy

ONSITE WASTEWATER SYSTEM FOR COTTAGE ON LOT 13 DP 2465
AT HAKA HAKA BAY, PORT UNDERWOOD
REF NO U051124

With reference to your emails of 25 November and 30 November and our discussions on 2 December I wish to confirm the following

1. I attach the detailed documentation for the Site Information and Site and Soil Evaluation as requested. The main points from the Site and Soil Evaluation were summarised in my report dated 26 October 2005.
2. The number of bedrooms in the cottage is two. The source of water is from a small simple community water supply scheme from the stream in the valley upslope of the property. I have recommended in my report that standard water reduction fixtures should be installed including dual flush 11/5 litre wc toilets and shower flow restrictors and aerator faucets and water conserving washing machines. With reference to AS1547 Appendix 4.2D a typical wastewater flow allowance of 150 litres per person per day is considered appropriate and allowing for upto four people at the cottage the total wastewater flow is 600 litres per day. Discussions with the owners indicates that the cottage will have intermittent use and be mainly used in the summer and not be used much in the winter.
3. The drainlayer has arranged to get the sand for the sand filter from the Gills Quarry ex Wairau River. The sieve analysis done on 26.7 .2005 included in my report shows that the grading is within the required 2A envelope. I have instructed the drainlayer to obtain another sieve analysis when he gets the sand for this sand filter to check that it is within the 2A envelope.
4. The drainlayer and I have researched sand filters extensively and consider the proposed system to be the best practicable option for this property. We propose that the sand filter be dosed very frequently with small doses rather than occasional large doses to ensure that the sand filter remains aerobic. The top of the sand filter will be well above original ground and the sand filter will have an impermeable liner and subsurface cutoff drains will be provided on the upslope side to ensure that no surface or groundwater enters the filter. There have been failures with sand filters in the past due to them being flooded with surface stormwater or groundwater flows and possibly also due to dosing with infrequent large doses.
5. I have confirmed with the drainlayer that the subsurface cutoff drain is only on the upslope side of the sandfilter around the NW and SW sides and not on the SE side. The SE side will have a solid (non perforated) pipe without gravel.
6. I am not on your present list of accredited site and soil evaluators on the MDC website. However I believe that I am suitably qualified to carry out site and soil evaluations. I have been a registered consulting engineer in New Zealand since 1982 and have prepared the evaluations, designs and reports for over 80 individual on site waste water systems in the Nelson, Tasman and Marlborough regions during the past 20 years including the upgrade of systems for the Pelorus Scenic Reserve Complex and Cobb Power Station . I include a copy of my summary CV for your reference. I organised the IPENZ Seminar on On Site Wastewater Management in 2004 which was tutored by Ian Gunn and approximately

40 engineers and local council staff attended. Please let me know how I can apply to be included on the MDC list of accredited evaluators.

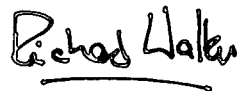
I will send the copy of the photos included in my March 2005 report by fast post together with the copy of my summary CV.

Please let me know if you require any further information or if you have any queries or wish to discuss further.

Please could you try and arrange for the application to be processed as soon as is possible so that the Drainlayer can install the new system before mid December.

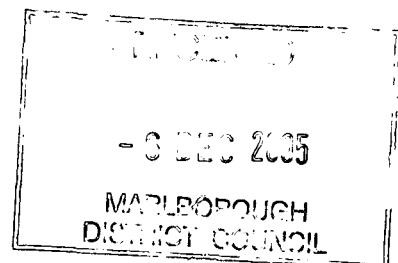
Thank you.

Yours faithfully



Richard Walker

cc T &H Parr (c/o Diane Cranfield)
Drainlayer Murray Warburton



CURRICULUM VITAE

NAME: Richard WALKER

DATE OF BIRTH: 26 February 1951

PROFESSION: Consulting Engineer

NATIONALITY: New Zealand/British

KEY QUALIFICATIONS:

Thirty two years experience in feasibility studies, materials and site investigations, engineering design, contract documentation, construction management and site supervision of civil engineering projects in Africa, Asia and the Pacific.

Extensive experience with the site and soil evaluation and design and reporting for onsite wastewater schemes for individual lots, rural residential housing developments and larger scale schemes for accommodation and recreational facilities and communities.

Broad range of experience in many other fields of civil and structural and environmental engineering including roads in difficult terrain, foundations, bridges, retaining walls, water supply, stormwater drainage, land development, hydrology, flood protection, aquaculture and housing, particularly earth building.

Considerable experience in training and management of large teams of local engineering staff for the design and supervision of engineering projects.

Excellent record of working successfully with senior local government engineering staff in the administration of engineering contracts and design of new works.

Some relevant assignments include:

Consultant, Hillwood Valley Rural Residential Housing Development	1996-2005, New Zealand
Consultant, Cobb Hydroelectric Project	1988-2005, New Zealand
Consultant, PuPu Walkway and Bridge Project	2001-2005, New Zealand
Consultant, Monaco Village Project	2004-2005, New Zealand
Consultant, Greenmeadows Flood Detention Scheme	2000, New Zealand
Consultant, New Zealand Earthbuilding Standards	1995-1999, New Zealand
Consultant, Whakapuaka Wildlife Reserve	1995, New Zealand
Consultant, Nelson Recycling Centre	1995, New Zealand
Project Manager, Gaborone Trunk Roads Study	1993-1994, Botswana
Senior Resident Engineer, Rural Infrastructure Development Project 13	1992-1993, Bangladesh
Consultant, Pelorus Scenic Reserve Complex Wastewater Scheme	1992, New Zealand
Consultant, Komarindi Hydropower Project Access Road	1990, Solomon Islands
Consultant, Malthouse Subdivision Flood Protection Scheme	1986, New Zealand
Project Leader, Kerling to Fraser's Hill Highway Project	1985-1986, Malaysia
Senior Highway Engineer, Kuala Lumpur Middle Ring Road Study	1986, Malaysia
Senior Design Engineer, PuPu Valley Flood Protection Scheme	1983, New Zealand
Senior Design Engineer, Eves Valley Sawmill Project	1983, New Zealand
Assistant Resident Engineer, Berbera to Burao Road Project	1978-1980, Somalia
Senior Design Engineer, Waa to Likoni Road	1978, Kenya
Senior Design Engineer, Al Husenia to Suk Alahad Road	1977, North Yemen
Design Engineer, Muscat-Mutrah Sea Road	1976, Oman
Design Engineer, Lake Victoria Circuit Road	1975, Tanzania
Assistant Highway Engineer, Mahalapye to Serule Road Feasibility Study	1975, Botswana
Assistant Resident Engineer, Selibe Phikwe Township Contract	1973-1974, Botswana

EDUCATION:

Bachelor of Science (Honours Degree in Civil Engineering), Bristol University, United Kingdom, 1972

Member, Institution of Professional Engineers of New Zealand, 1982

Chartered Engineer (UK), 1977

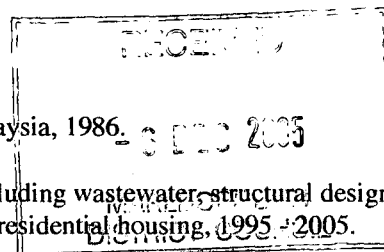
Registered Engineer (NZ), 1982

Short Course on Computers in Engineering, Canterbury University, N.Z. 1984.

Short Course on Engineering Contracts with Duncan Wallace, Kuala Lumpur, Malaysia, 1986.

Diploma in Permaculture Design, Permaculture Institute, 1992

Numerous Continuing Professional Development Courses on a range of subjects including wastewater, structural design, retaining walls, foundations, engineering contracts and engineering issues related to residential housing, 1995-2005.



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26.10.2005

SITE INFORMATION (DESK TOP EVALUATION)
FOR NEW EFFLUENT DISPOSAL SYSTEM FOR
PARR COTTAGE AT HAKA HAKA BAY

1.1 LOCATION DETAILS

LOCALITY: HAKA HAKA BAY, PORT UNDERWOOD

OWNER : TREVOR PARR AND DIANE CRANFIELD AND DAPHNE DAYSH

ADDRESS : 12 HAKAHAKA ROAD, PORT UNDERWOOD

PHONE : C/O D CRANFIELD, TEL: 04-9771378

SURVEY PLAN DETAILS : LOT 13 DP 2465 BLKXII ARAPAWA SD

GRID REFERENCE : E 2603194, N 5989243

AERIAL PHOTO DETAILS : MDC PHOTO FLOWN 2002

TOPO MAP NO : NZMS 260 P27

ORTHOPHOTOMAP: NOT APPLICABLE (N/A)

REGIONAL AUTHORITY : MARLBOROUGH DISTRICT COUNCIL (MDC)

LOCAL GOVERNMENT : MDC

SITE PLAN : REFER TO DRG NO ESS 986/01 & IRVING JACK ARCHITECTS SITE PLAN

1.2 SOIL TYPE AND MAJOR SOIL CONSIDERATIONS

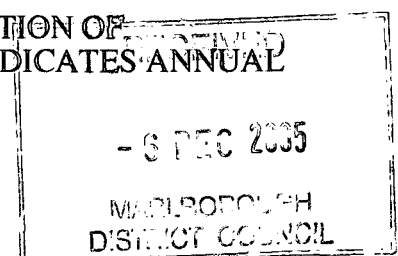
TOPO AND GEOLOGICAL MAPS INDICATE SOILS ARE ALLUVIAL FAN DEPOSITS.
DISCUSSIONS WITH OWNER INDICATE SUBSURFACE MATERIALS COMPRISE SANDY
TOPSOIL UNDERLAIN BY SILT LOAM.

1.3 GEOLOGY OF SITE

EXISTING GEOLOGICAL MAPPING INDICATES UNDERLYING GEOLOGY
COMPRISES SCHISTS OF THE MARLBOROUGH SERIES.

1.4 CLIMATE

NO RECORDS AVAILABLE FOR HAKAHAKA BAY. INTERPOLATION OF
INFORMATION FROM ADJACENT SITES ON MDC WEBSITE INDICATES ANNUAL
RAINFALL OF APPROXIMATELY 1000 MM.



1.5 WATER SUPPLY SOURCE

WATER SUPPLY FOR HOUSE IS FROM EXISTING COMMUNITY SCHEME FROM STREAM IN VALLEY UPSLOPE OF THE PROPERTY.

1.6 LOCAL EXPERIENCE WITH EXISTING ONSITE SYSTEMS

THE OLD DWELLING ON THE PROPERTY HAD A SMALL 1500 LITRE SEPTIC TANK AND FIELD DRAIN SOAKAGE TRENCH APPROXIMATELY 35 METRES LONG WHICH THE OWNER TREVOR PARR REPORTS HAS PERFORMED SATISFACTORILY WITH NO PROBLEMS FOR MANY YEARS.

THERE ARE APPROXIMATELY 20 HOUSES AT HAKA HAKA BAY. ACTUAL DETAILS AND PERFORMANCE OF EXISTING SYSTEMS IS NOT KNOWN. DRAINLAYER MURRAY WARBURTON REPORTS THAT ONE PROPERTY NEARBY ON OTHER SIDE OF HAKAHAKA BAY ROAD HAS A SAND FILTER EFFLUENT DISPOSAL SYSTEM WHICH EXPERIENCED SOME PROBLEMS BEFORE STORMWATER AND SUBSURFACE CUTOFF DRAINS WERE INSTALLED BUT WHICH IS NOW WORKING SATISFACTORILY AFTER THE DRAINS WERE INSTALLED.

1.7 PRELIMINARY EVALUATION OF SOLUTIONS WHICH COULD BE FEASIBLE

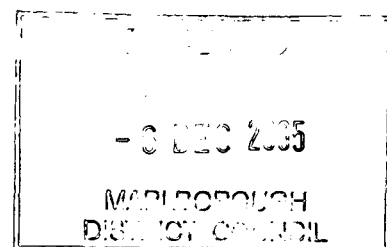
DRAINLAYER REPORTS THAT DURING THE WINTER MONTHS GROUNDWATER TABLE CAN BE CLOSE TO THE GROUND SURFACE PARTICULARLY DURING WET WEATHER.

CONVENTIONAL SOAKAGE SYSTEMS ARE NOT SUITABLE DUE TO THE HIGH GROUNDWATER LEVELS DURING WET WINTER MONTHS.

AERATED WASTEWATER TREATMENT PLANT (AWTP) NOT VERY SUITABLE AS THE COTTAGE WILL HAVE INTERMITTENT USE.

DISCUSSIONS WITH DRAINLAYER MURRAY WARBURTON INDICATE THAT SEPTIC TANK WITH INTERMITTENT SAND FILTER AND DRIPPER BED MAY BE THE MOST APPROPRIATE SYSTEM FOR THIS SITE.

Richard Weller



26.10.2005

SITE AND SOIL EVALUATION (SSE) FOR
NEW EFFLUENT DISPOSAL SYSTEM FOR
PARR COTTAGE AT HAKA HAKA BAY

1.0 SITE EVALUATORS

PRINCIPAL EVALUATOR : CONSULTING ENGINEER RICHARD WALKER, ESS LTD.
(ADDRESS AND DETAILS ABOVE)

ADDITIONAL SITE AND SOIL EVALUATION INFORMATION PROVIDED BY DRAINLAYER
MURRAY WARBURTON AND OWNER TREVOR PARR.

2. ON-SITE EVALUATION

2.1 WORK UNDERTAKEN

SMALL TEST PIT AND PERCOLATION TEST BY OWNER TREVOR PARR ON 26.1.2005. SOIL
SAMPLES TAKEN FROM TEST PIT BY TREVOR PARR AND GIVEN TO RICHARD WALKER
FOR SOIL ASSESSMENT AND EVALUATION

ON SITE EVALUATION OF SOILS AND SITE CONDITIONS BY DRAINLAYER MURRAY
WARBURTON DURING EXCAVATIONS FOR SEPTIC TANK AND SOAKAGE TRENCHES FOR
INSTALLATION OF GREYWATER SYSTEM EARLIER IN AUTUMN OF 2005.

2.2 TOPOGRAPHY

SLOPE : TOPOGRAPHIC SITE SURVEY FOR ARCHITECTURAL SITE PLAN INDICATES
GENTLE SLOPE OF 4 DEGREES TO THE EAST.

GEOLOGY: NO SCHIST BEDROCK ENCOUNTERED IN TEST PIT OR EXCAVATIONS FOR
SEPTIC TANKS OR SOAKAGE TRENCHES.

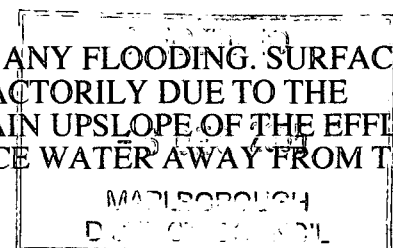
SOIL LANDSCAPE : SITE INFORMATION INDICATES INSITU SOILS ARE ALLUVIAL FAN
DEPOSITS.

BOUNDARIES: REFER TO SITE PLAN DRG NO ESS986/01A AND ARCHITECTURAL SITE
PLAN. MINIMUM OF 2 METRES WILL BE PROVIDED BETWEEN SUBSURFACE IRRIGATION
AREA AND BOUNDARIES IN ACCORDANCE WITH MDC REQUIREMENTS.

DRAINAGE PATTERNS: REFER TO SITE PLAN DRG NO ESS986/01A AND ARCHITECTURAL
SITE PLAN.

LAND SURFACE SHAPE: IS GENERALLY LINEAR PLANAR AT EFFLUENT DISPOSAL AREA
WITH GOOD WATER SHEDDING SURFACE AND DRAINAGE AND WITH A GENTLE SLOPE
OF 4 DEGREES TO THE EAST.

FLOODING: THE EFFLUENT DISPOSAL AREA IS CLEAR OF ANY FLOODING. SURFACE
RUNOFF FROM HEAVY RAINSTORMS CAN DRAIN SATISFACTORILY DUE TO THE
EXISTING NATURAL SLOPE. A SUBSURFACE CUTOFF DRAIN UPSLOPE OF THE EFFLUENT
DISPOSAL AREA WILL DIVERT SUBSURFACE AND SURFACE WATER AWAY FROM THE
EFFLUENT DISPOSAL AREA.



CONCENTRATED RUNOFF : NO AREAS THAT MIGHT PRODUCE CONCENTRATED RUNOFF TOWARDS OR AWAY FROM THE EFFLUENT DISPOSAL AREA WERE EVIDENT.

WATERWAYS: THE EFFLUENT DISPOSAL AREA IS LOCATED WELL CLEAR OF ANY WATERCOURSES AND THE FORESHORE. THE DISTANCE TO THE HIGH WATER MARK IS APPROXIMATELY 50 METRES.

VEGETATION AND TREES: THE EFFLUENT DISPOSAL AREA IS PRESENTLY COVERED IN GRASS. THERE IS A STRIP OF TREES AND SHRUBS ALONG THE SOUTH BOUNDARY OF THE PROPERTY.

WELLS AND BORES: THE WATER SUPPLY FOR THIS PROPERTY AND ADJACENT PROPERTIES IS FROM THE COMMUNITY WATER SUPPLY SCHEME FROM THE STREAM IN THE VALLEY UPSLOPE OF THE PROPERTY.

FILL: THERE ARE NO FILL AREAS AT OR ADJACENT TO THE EFFLUENT DISPOSAL AREA.

BUILDINGS: THE EFFLUENT DISPOSAL AREA IS TO THE SOUTH OF THE NEW COTTAGE. THERE WILL BE A MINIMUM OF 2 METRES CLEARANCE BETWEEN THE EFFLUENT DISPOSAL SUBSURFACE IRRIGATION AREA AND THE NEW COTTAGE.

2.3 SITE EXPOSURE

SITE ASPECT: THE EFFLUENT DISPOSAL AREA IS ON A GENTLE EAST FACING SLOPE BETWEEN THE SEA TO THE EAST AND STEEP HILL SLOPES TO THE WEST.

DOMINANT WIND DIRECTION: THE PROPERTY IS EXPOSED TO EASTERLIES BUT RELATIVELY SHELTERED TO WINDS IN OTHER DIRECTIONS DUE TO THE TOPOGRAPHY.

SHELTER BELTS: THERE ARE TREES AND SHRUBS ALONG THE BOUNDARIES ON THE SOUTH, EAST AND WEST BOUNDARIES.

STRUCTURES: THE DISPOSAL AREA IS SHELTERED FROM NORTHERLIES BY THE NEW COTTAGE

POTENTIAL FOR EVAPOTRANSPIRATION: THE EFFLUENT DISPOSAL AREA IS CONSIDERED TO HAVE REASONABLY GOOD POTENTIAL FOR EVAPOTRANSPIRATION.

2.4 ENVIRONMENTAL CONCERNS

THE PROPERTY IS IN THE MARLBOROUGH SOUNDS COASTAL AREA AND REQUIRES A RESOURCE CONSENT FOR THE DISCHARGE OF DOMESTIC WASTEWATER. THE HIGH WATER MARK IS APPROXIMATELY 50 METRES TO THE SOUTH EAST.

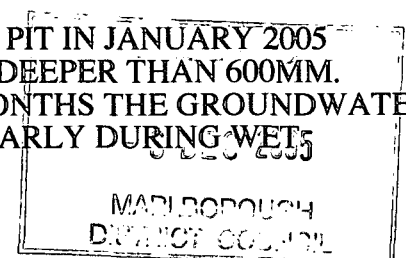
THE OWNERS STATE THAT THE COTTAGE WILL BE USED MAINLY DURING THE SUMMER MONTHS WITH LITTLE USE DURING THE WINTER MONTHS.

2.5 SITE STABILITY

THE SITE IS LOCATED ON A VERY GENTLE SLOPE. THERE ARE NO SIGNS OF SLOPE INSTABILITY THAT WOULD ADVERSELY IMPACT THE EFFLUENT DISPOSAL AREA. WITH RESPECT TO ADJACENT BUILDINGS OR PROPERTIES, THE DISCHARGE OF WASTEWATER AT THE EFFLUENT DISPOSAL AREA IS UNLIKELY TO INITIATE INSTABILITY.

2.6 DRAINAGE CONTROLS

SOIL WATER REGIME AND SEASONAL WATERTABLE: A TEST PIT IN JANUARY 2005 INDICATED THE GROUNDWATER TABLE IN SUMMER TO BE DEEPER THAN 600MM. MURRAY WARBURTON REPORTS THAT DURING WINTER MONTHS THE GROUNDWATER TABLE CAN BE CLOSE TO THE GROUND SURFACE PARTICULARLY DURING WET WEATHER.



NEED FOR CUTOFF DRAINS: A CUTOFF SUBSURFACE DRAIN IS RECOMMENDED ALONG THE UPSLOPE SIDES OF THE EFFLUENT DISPOSAL AREA. THE TYPICAL CROSS-SECTION IS SHOWN ON DRG NO ESS986/04. THE SUBSURFACE DRAIN WILL BE ONLY ALONG THE NW AND SW SIDES (UPSLOPE SIDES) OF THE EFFLUENT DISPOSAL AREA. THE DRAIN WILL BE A SOLID 100 DIA STORMWATER PIPE ON THE DOWNSLOPE (SE) SIDE OF THE EFFLUENT DISPOSAL AREA.

2.7 AVAILABILITY OF RESERVE/ SETBACK AREAS

REFER TO SITE PLAN DRG NO ESS986/01A.

REFERENCE TO THE SITE PLAN INDICATES THAT THERE IS 311 SQUARE METRES AVAILABLE ON THE SECTION FOR THE LAND APPLICATION AREA FOR THE DRIPPER BEDS.

REFERENCE TO THE DESIGN CALCULATIONS AND REPORT INDICATES THAT A MINIMUM OF 168 SQUARE METRES IS REQUIRED FOR THE DRIPPER BEDS.

THUS THERE IS ROOM FOR EXTENSION TO THE LAND APPLICATION AREA IN THE FUTURE AS A CONTINGENCY IF WATER USE IS HIGHER THAN ESTIMATED OR THE ACHIEVABLE DESIGN IRRIGATION RATE (DIR) IS LOWER THAN ESTIMATED. THE RESERVE AREA FOR EXTENSION IS 85 PERCENT OF THE DESIGN AREA.

IT IS RECOMMENDED THAT A WATER FLOW METER BE INSTALLED SO THAT ACTUAL WASTE WATER USE CAN BE MEASURED AND THE REQUIREMENT FOR EXTENSION TO THE DRIPPER BEDS MORE ACCURATELY DETERMINED.

A MINIMUM CLEARANCE OF 2 METRES HAS BEEN PROVIDED BETWEEN THE EDGE OF THE EFFLUENT DISPOSAL AREA AND THE PROPERTY BOUNDARIES AND THE NEW COTTAGE.

2.8 PHOTOGRAPHS

PHOTOS OF EFFLUENT DISPOSAL AREA AND TEST HOLE SHOWING SUBSURFACE MATERIALS OF TOPSOIL AND SILTY LOAM INCLUDED WITH REPORT FOR ORIGINAL GREYWATER SYSTEM DATED 8 MARCH 2005. COPY ATTACHED TO THIS EVALUATION.

3. SOIL INVESTIGATION

3.1 SOIL PROFILE DETERMINATION

SOIL PROFILE DETERMINED BY TEST PIT IN JANUARY 2005 AND REPORTING ON SOIL PROFILE BY DRAINLAYER M WARBURTON DURING EXCAVATIONS FOR SEPTIC TANK AND SOAKAGE TRENCH IN AUTUMN 2005.

3.2 SOIL PROFILE REPORTING

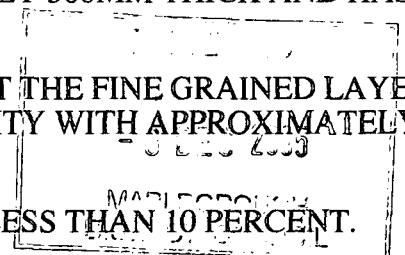
SOIL PROFILE: TEST PIT AT SITE AND EXCAVATIONS AT SITE INDICATES SUBSURFACE MATERIALS ARE :

300MM OF FINE SANDY TOPSOIL AND ROOTS UNDERLAIN BY GREYISH YELLOW MOIST SILTY LOAM OF LOW PLASTICITY.

SOIL SURFACE CONDITION: INSPECTION OF THE TEST PIT AND TOPSOIL LAYER AND MATERIAL INDICATES THAT THE TOPSOIL IS APPROXIMATELY 300MM THICK AND HAS SATISFACTORY STRUCTURE AND DRAINAGE.

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PERCENTAGE OF COARSE FRAGMENTS : ESTIMATED TO BE LESS THAN 10 PERCENT.



· SOIL STRUCTURE : ASSESSED CONSERVATIVELY AS MASSIVE.

SOIL DISPERSION : NOT ASSESSED

PERCOLATION TEST : PERCOLATION TEST IN JANUARY 2005 SHOWED MODERATE DRAINAGE WITH A PERCOLATION RATE OF 52 MM PER HOUR.

3.3 ESTIMATED SOIL CATEGORY

SOIL ASSESSED IN MARCH 2005 FOR GREYWATER SYSTEM AS CATEGORY 3 AND MODERATELY WELL DRAINED.

WITH CONSIDERATION OF CHANGE TO SYSTEM WITH FLUSH TOILET AND HIGH WATER TABLE DURING WET WEATHER IN THE WINTER, SOIL CATEGORY FOR SYSTEM WITH FLUSH TOILET ASSESSED, MORE CONSERVATIVELY THAN PREVIOUSLY IN MARCH 2005, AS CATEGORY 4 AND IMPERFECTLY DRAINED.

3.4 RECOMMENDED DESIGN IRRIGATION RATE (DIR)

WITH REFERENCE TO AS1547 TABLE 4.2A4,
RECOMMENDED DESIGN IRRIGATION RATE FOR CATEGORY 4 SOIL = 25 MM PER WEEK

RECOMMENDED DIR OF 25MM PER WEEK CONSIDERED REASONABLE WITH RESPECT TO RESULTS OF SITE AND SOIL EVALUATION.

THERE IS SUFFICIENT RESERVE AREA ON THE SECTION TO ALSO ACCOMMODATE A LOWER DIR OF 20 MM PER WEEK APPLICABLE FOR CATEGORY 5 SOILS IF FOR ANY REASON ACHIEVABLE DIR IS LOWER THAN THE RECOMMENDED DIR OF 25 MM PER WEEK.

4. GENERAL COMMENTS

4.1 GROUNDWATER QUALITY ISSUES

SUBSURFACE CUTOFF DRAIN RECOMMENDED ON UPSLOPE SIDE OF DRIPPER BED TO CONTROL HIGH GROUNDWATER TABLE DURING WET WINTER MONTHS.

4.2 RECOMMENDED LAND APPLICATION SYSTEM

BEST PRACTICABLE OPTION FOR THIS SECTION WITH AN ONSITE WASTEWATER SYSTEM WITH FLUSH TOILET IS CONSIDERED TO BE MULTI CHAMBER SEPTIC TANK WITH ZABEL FILTER AT OUTLET AND SINGLE PASS SAND FILTER WITH PUMP DOSE LOADING TO SUBSURFACE DRIPPER BED IRRIGATION AREA PARTICULARLY AS THE COTTAGE IS LIKELY TO HAVE INTERMITTENT USE AND BE MAINLY USED IN THE SUMMER MONTHS AND NOT USED MUCH IN THE WINTER.

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TOTAL AREA AVAILABLE FOR DRIPPER BEDS IS 311 SQUARE METRES ALLOWING FOR 2 METRES MINIMUM CLEARANCE TO BOUNDARIES AND BUILDINGS. MINIMUM AREA REQUIRED ASSUMING CATEGORY 4 SOIL WITH DIR OF 25 MM PER WEEK IS 168 SQUARE METRES.

4.4 CONSULTATION WITH OTHER INTERESTED PARTIES

NO DISCUSSION UNDERTAKEN WITH NEIGHBOURS. NEIGHBOURS UNLIKELY TO BE AFFECTED BY PROPOSED SYSTEM WHICH WILL TREAT EFFLUENT TO A HIGH STANDARD PRIOR TO DISPOSAL IN LANDSCAPED DRIPPER BEDS. SYSTEM IS OF MUCH HIGHER STANDARD THAN MANY OF NEIGHBOURING LOTS WITH CONVENTIONAL SOAKAGE SYSTEMS.

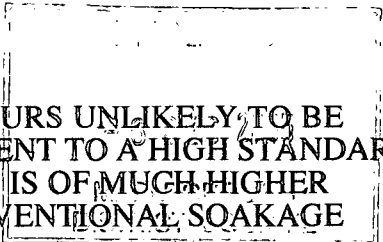

Pivod Walker



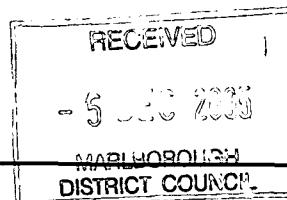
Photo 1 - Effluent disposal area for Parr cottage



Photo 2 - Test hole showing subsurface materials of topsoil and silty loam

RECEIVED
- 6 DEC 2005
MARLBOROUGH
DISTRICT COUNCIL

RICHARD WALKER
CONSULTING PROFESSIONAL ENGINEER
ENGINEERING SUSTAINABLE SOLUTIONS LTD



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FAX

8 PAGES

3 December 2005

Guy Boddington
Marlborough District Council
PO Box 443
Blenheim

Fax No 03-5786866

Dear Guy

ONSITE WASTEWATER SYSTEM FOR COTTAGE ON LOT 13 DP 2465
AT IAKA HAKA BAY, PORT UNDERWOOD
REF NO U051124

With reference to your emails of 25 November and 30 November and our discussions on 2 December I wish to confirm the following

1. I attach the detailed documentation for the Site Information and Site and Soil Evaluation as requested. The main points from the Site and Soil Evaluation were summarised in my report dated 26 October 2005.
2. The number of bedrooms in the cottage is two. The source of water is from a small simple community water supply scheme from the stream in the valley upslope of the property. I have recommended in my report that standard water reduction fixtures should be installed including dual flush 11/5 litre wc toilets and shower flow restrictors and aerator faucets and water conserving washing machines. With reference to ASI547 Appendix 4.2D a typical wastewater flow allowance of 150 litres per person per day is considered appropriate and allowing for upto four people at the cottage the total wastewater flow is 600 litres per day. Discussions with the owners indicates that the cottage will have intermittent use and be mainly used in the summer and not be used much in the winter.
3. The drainlayer has arranged to get the sand for the sand filter from the Gills Quarry ex Wairau River. The sieve analysis done on 26.7.2005 included in my report shows that the grading is within the required 2A envelope. I have instructed the drainlayer to obtain another sieve analysis when he gets the sand for this sand filter to check that it is within the 2A envelope.
4. The drainlayer and I have researched sand filters extensively and consider the proposed system to be the best practicable option for this property. We propose that the sand filter be dosed very frequently with small doses rather than occasional large doses to ensure that the sand filter remains aerobic. The top of the sand filter will be well above original ground and the sand filter will have an impermeable liner and subsurface cutoff drains will be provided on the upslope side to ensure that no surface or groundwater enters the filter. There have been failures with sand filters in the past due to them being flooded with surface stormwater or groundwater flows and possibly also due to dosing with infrequent large doses.
5. I have confirmed with the drainlayer that the subsurface cutoff drain is only on the upslope side of the sandfilter around the NW and SW sides and not on the SE side. The SE side will have a solid (non perforated) pipe without gravel.
6. I am not on your present list of accredited site and soil evaluators on the MDC website. However I believe that I am suitably qualified to carry out site and soil evaluations. I have been a registered consulting engineer in New Zealand since 1982 and have prepared the evaluations, designs and reports for over 80 individual on site waste water systems in the Nelson, Tasman and Marlborough regions during the past 20 years including the upgrade of systems for the Pelorus Scenic Reserve Complex and Cobb Power Station . I include a copy of my summary CV for your reference. I organised the IPENZ Seminar on On Site Wastewater Management in 2004 which was tutored by Ian Gunn and approximately

40 engineers and local council staff attended. Please let me know how I can apply to be included on the MDC list of accredited evaluators.

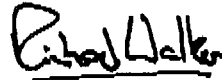
I will send the copy of the photos included in my March 2005 report by fast post together with the copy of my summary CV.

Please let me know if you require any further information or if you have any queries or wish to discuss further.

Please could you try and arrange for the application to be processed as soon as is possible so that the Drainlayer can install the new system before mid December.

Thank you.

Yours faithfully



Richard Walker

cc T &H Parr (c/o Diane Cranfield)
Drainlayer Murray Warburton

RICHARD WALKER
CONSULTING PROFESSIONAL ENGINEER
ENGINEERING SUSTAINABLE SOLUTIONS LTD

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TEL: (64)-3-5284751
FAX: (64)-3-5469170

26.10.2005

**SITE INFORMATION (DESK TOP EVALUATION)
FOR NEW EFFLUENT DISPOSAL SYSTEM FOR
PARR COTTAGE AT HAKA HAKA BAY**

1.1 LOCATION DETAILS

LOCALITY: HAKA HAKA BAY, PORT UNDERWOOD

OWNER : TREVOR PARR AND DIANE CRANFIELD AND DAPHNE DAYSH

ADDRESS : 12 HAKAHAKA ROAD. PORT UNDERWOOD

PHONE : C/O D CRANFIELD, TEL: 04-9771378

SURVEY PLAN DETAILS : LOT 13 DP 2465 BLKXII ARAPAWA SD

GRID REFERENCE : E 2603194, N 5989243

AERIAL PHOTO DETAILS : MDC PHOTO FLOWN 2002

TOPO MAP NO : NZMS 260 P27

ORTHOPHOTOMAP: NOT APPLICABLE (N/A)

REGIONAL AUTHORITY : MARLBOROUGH DISTRICT COUNCIL (MDC)

LOCAL GOVERNMENT : MDC

SITE PLAN : REFER TO DRG NO ESS 986/01 & IRVING JACK ARCHITECTS SITE PLAN

1.2 SOIL TYPE AND MAJOR SOIL CONSIDERATIONS

TOPO AND GEOLOGICAL MAPS INDICATE SOILS ARE ALLUVIAL FAN DEPOSITS.
DISCUSSIONS WITH OWNER INDICATE SUBSURFACE MATERIALS COMPRISE SANDY
TOPSOIL UNDERLAIN BY SILT LOAM.

1.3 GEOLOGY OF SITE

EXISTING GEOLOGICAL MAPPING INDICATES UNDERLYING GEOLOGY
COMPRISES SCHISTS OF THE MARLBOROUGH SERIES.

1.4 CLIMATE

NO RECORDS AVAILABLE FOR HAKAHAKA BAY. INTERPOLATION OF
INFORMATION FROM ADJACENT SITES ON MDC WEBSITE INDICATES ANNUAL
RAINFALL OF APPROXIMATELY 1000 MM.

1.5 WATER SUPPLY SOURCE

WATER SUPPLY FOR HOUSE IS FROM EXISTING COMMUNITY SCHEME FROM STREAM IN VALLEY UPSLOPE OF THE PROPERTY.

1.6 LOCAL EXPERIENCE WITH EXISTING ONSITE SYSTEMS

THE OLD DWELLING ON THE PROPERTY HAD A SMALL 1500 LITRE SEPTIC TANK AND FIELD DRAIN SOAKAGE TRENCH APPROXIMATELY 35 METRES LONG WHICH THE OWNER TREVOR PARR REPORTS HAS PERFORMED SATISFACTORILY WITH NO PROBLEMS FOR MANY YEARS.

THERE ARE APPROXIMATELY 20 HOUSES AT HAKA HAKA BAY. ACTUAL DETAILS AND PERFORMANCE OF EXISTING SYSTEMS IS NOT KNOWN. DRAINLAYER MURRAY WARBURTON REPORTS THAT ONE PROPERTY NEARBY ON OTHER SIDE OF HAKAHAKA BAY ROAD HAS A SAND FILTER EFFLUENT DISPOSAL SYSTEM WHICH EXPERIENCED SOME PROBLEMS BEFORE STORMWATER AND SUBSURFACE CUTOFF DRAINS WERE INSTALLED BUT WHICH IS NOW WORKING SATISFACTORILY AFTER THE DRAINS WERE INSTALLED.

1.7 PRELIMINARY EVALUATION OF SOLUTIONS WHICH COULD BE FEASIBLE

DRAINLAYER REPORTS THAT DURING THE WINTER MONTHS GROUNDWATER TABLE CAN BE CLOSE TO THE GROUND SURFACE PARTICULARLY DURING WET WEATHER.

CONVENTIONAL SOAKAGE SYSTEMS ARE NOT SUITABLE DUE TO THE HIGH GROUNDWATER LEVELS DURING WET WINTER MONTHS.

AERATED WASTEWATER TREATMENT PLANT (AWTP) NOT VERY SUITABLE AS THE COTTAGE WILL HAVE INTERMITTENT USE.

DISCUSSIONS WITH DRAINLAYER MURRAY WARBURTON INDICATE THAT SEPTIC TANK WITH INTERMITTENT SAND FILTER AND DRIPPER BED MAY BE THE MOST APPROPRIATE SYSTEM FOR THIS SITE.

Richard Walker

RICHARD WALKER
CONSULTING PROFESSIONAL ENGINEER
ENGINEERING SUSTAINABLE SOLUTIONS LTD

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26.10.2005

SITE AND SOIL EVALUATION (SSE) FOR NEW EFFLUENT DISPOSAL SYSTEM FOR PARR COTTAGE AT HAKA HAKA BAY

1.0 SITE EVALUATORS

PRINCIPAL EVALUATOR : CONSULTING ENGINEER RICHARD WALKER, ESS LTD.
(ADDRESS AND DETAILS ABOVE)

ADDITIONAL SITE AND SOIL EVALUATION INFORMATION PROVIDED BY DRAINLAYER
MURRAY WARBURTON AND OWNER TREVOR PARR.

2. ON-SITE EVALUATION

2.1 WORK UNDERTAKEN

SMALL TEST PIT AND PERCOLATION TEST BY OWNER TREVOR PARR ON 26.1.2005. SOIL
SAMPLES TAKEN FROM TEST PIT BY TREVOR PARR AND GIVEN TO RICHARD WALKER
FOR SOIL ASSESSMENT AND EVALUATION

ON SITE EVALUATION OF SOILS AND SITE CONDITIONS BY DRAINLAYER MURRAY
WARBURTON DURING EXCAVATIONS FOR SEPTIC TANK AND SOAKAGE TRENCHES FOR
INSTALLATION OF GREYWATER SYSTEM EARLIER IN AUTUMN OF 2005.

2.2 TOPOGRAPHY

SLOPE : TOPOGRAPHIC SITE SURVEY FOR ARCHITECTURAL SITE PLAN INDICATES
GENTLE SLOPE OF 4 DEGREES TO THE EAST.

GEOLOGY: NO SCHIST BEDROCK ENCOUNTERED IN TEST PIT OR EXCAVATIONS FOR
SEPTIC TANKS OR SOAKAGE TRENCHES.

SOIL LANDSCAPE : SITE INFORMATION INDICATES INSITU SOILS ARE ALLUVIAL FAN
DEPOSITS.

BOUNDARIES: REFER TO SITE PLAN DRG NO ESS986/01A AND ARCHITECTURAL SITE
PLAN. MINIMUM OF 2 METRES WILL BE PROVIDED BETWEEN SUBSURFACE IRRIGATION
AREA AND BOUNDARIES IN ACCORDANCE WITH MDC REQUIREMENTS.

DRAINAGE PATTERNS: REFER TO SITE PLAN DRG NO ESS986/01A AND ARCHITECTURAL
SITE PLAN.

LAND SURFACE SHAPE: IS GENERALLY LINEAR PLANAR AT EFFLUENT DISPOSAL AREA
WITH GOOD WATER SHEDDING SURFACE AND DRAINAGE AND WITH A GENTLE SLOPE
OF 4 DEGREES TO THE EAST.

FLOODING: THE EFFLUENT DISPOSAL AREA IS CLEAR OF ANY FLOODING. SURFACE
RUNOFF FROM HEAVY RAINSTORMS CAN DRAIN SATISFACTORILY DUE TO THE
EXISTING NATURAL SLOPE. A SUBSURFACE CUTOFF DRAIN UPSLOPE OF THE EFFLUENT
DISPOSAL AREA WILL DIVERT SUBSURFACE AND SURFACE WATER AWAY FROM THE
EFFLUENT DISPOSAL AREA.

CONCENTRATED RUNOFF : NO AREAS THAT MIGHT PRODUCE CONCENTRATED RUNOFF TOWARDS OR AWAY FROM THE EFFLUENT DISPOSAL AREA WERE EVIDENT.

WATERWAYS: THE EFFLUENT DISPOSAL AREA IS LOCATED WELL CLEAR OF ANY WATERCOURSES AND THE FORESHORE. THE DISTANCE TO THE HIGH WATER MARK IS APPROXIMATELY 50 METRES.

VEGETATION AND TREES: THE EFFLUENT DISPOSAL AREA IS PRESENTLY COVERED IN GRASS. THERE IS A STRIP OF TREES AND SHRUBS ALONG THE SOUTH BOUNDARY OF THE PROPERTY.

WELLS AND BORES: THE WATER SUPPLY FOR THIS PROPERTY AND ADJACENT PROPERTIES IS FROM THE COMMUNITY WATER SUPPLY SCHEME FROM THE STREAM IN THE VALLEY UPSLOPE OF THE PROPERTY.

FILL: THERE ARE NO FILL AREAS AT OR ADJACENT TO THE EFFLUENT DISPOSAL AREA.

BUILDINGS: THE EFFLUENT DISPOSAL AREA IS TO THE SOUTH OF THE NEW COTTAGE. THERE WILL BE A MINIMUM OF 2 METRES CLEARANCE BETWEEN THE EFFLUENT DISPOSAL SUBSURFACE IRRIGATION AREA AND THE NEW COTTAGE.

2.3 SITE EXPOSURE

SITE ASPECT: THE EFFLUENT DISPOSAL AREA IS ON A GENTLE EAST FACING SLOPE BETWEEN THE SEA TO THE EAST AND STEEP HILL SLOPES TO THE WEST.

DOMINANT WIND DIRECTION: THE PROPERTY IS EXPOSED TO EASTERLIES BUT RELATIVELY SHELTERED TO WINDS IN OTHER DIRECTIONS DUE TO THE TOPOGRAPHY.

SHELTER BELTS: THERE ARE TREES AND SHRUBS ALONG THE BOUNDARIES ON THE SOUTH, EAST AND WEST BOUNDARIES.

STRUCTURES: THE DISPOSAL AREA IS SHELTERED FROM NORTHERLIES BY THE NEW COTTAGE

POTENTIAL FOR EVAPOTRANSPIRATION: THE EFFLUENT DISPOSAL AREA IS CONSIDERED TO HAVE REASONABLY GOOD POTENTIAL FOR EVAPOTRANSPIRATION.

2.4 ENVIRONMENTAL CONCERNS

THE PROPERTY IS IN THE MARLBOROUGH SOUNDS COASTAL AREA AND REQUIRES A RESOURCE CONSENT FOR THE DISCHARGE OF DOMESTIC WASTEWATER. THE HIGH WATER MARK IS APPROXIMATELY 50 METRES TO THE SOUTH EAST.

THE OWNERS STATE THAT THE COTTAGE WILL BE USED MAINLY DURING THE SUMMER MONTHS WITH LITTLE USE DURING THE WINTER MONTHS.

2.5 SITE STABILITY

THE SITE IS LOCATED ON A VERY GENTLE SLOPE. THERE ARE NO SIGNS OF SLOPE INSTABILITY THAT WOULD ADVERSELY IMPACT THE EFFLUENT DISPOSAL AREA. WITH RESPECT TO ADJACENT BUILDINGS OR PROPERTIES, THE DISCHARGE OF WASTEWATER AT THE EFFLUENT DISPOSAL AREA IS UNLIKELY TO INITIATE INSTABILITY.

2.6 DRAINAGE CONTROLS

SOIL WATER REGIME AND SEASONAL WATERTABLE: A TEST PIT IN JANUARY 2005 INDICATED THE GROUNDWATER TABLE IN SUMMER TO BE DEEPER THAN 600MM. MURRAY WARBURTON REPORTS THAT DURING WINTER MONTHS THE GROUNDWATER TABLE CAN BE CLOSE TO THE GROUND SURFACE PARTICULARLY DURING WET WEATHER.

NEED FOR CUTOFF DRAINS: A CUTOFF SUBSURFACE DRAIN IS RECOMMENDED ALONG THE UPSLOPE SIDES OF THE EFFLUENT DISPOSAL AREA. THE TYPICAL CROSS-SECTION IS SHOWN ON DRG NO ESS986/04. THE SUBSURFACE DRAIN WILL BE ONLY ALONG THE NW AND SW SIDES (UPSLOPE SIDES) OF THE EFFLUENT DISPOSAL AREA. THE DRAIN WILL BE A SOLID 100 DIA STORMWATER PIPE ON THE DOWNSLOPE (SE) SIDE OF THE EFFLUENT DISPOSAL AREA.

2.7 AVAILABILITY OF RESERVE/ SETBACK AREAS

REFER TO SITE PLAN DRG NO ESS986/01A.

REFERENCE TO THE SITE PLAN INDICATES THAT THERE IS 311 SQUARE METRES AVAILABLE ON THE SECTION FOR THE LAND APPLICATION AREA FOR THE DRIPPER BEDS.

REFERENCE TO THE DESIGN CALCULATIONS AND REPORT INDICATES THAT A MINIMUM OF 168 SQUARE METRES IS REQUIRED FOR THE DRIPPER BEDS.

THUS THERE IS ROOM FOR EXTENSION TO THE LAND APPLICATION AREA IN THE FUTURE AS A CONTINGENCY IF WATER USE IS HIGHER THAN ESTIMATED OR THE ACHIEVABLE DESIGN IRRIGATION RATE (DIR) IS LOWER THAN ESTIMATED. THE RESERVE AREA FOR EXTENSION IS 85 PERCENT OF THE DESIGN AREA.

IT IS RECOMMENDED THAT A WATER FLOW METER BE INSTALLED SO THAT ACTUAL WASTE WATER USE CAN BE MEASURED AND THE REQUIREMENT FOR EXTENSION TO THE DRIPPER BEDS MORE ACCURATELY DETERMINED.

A MINIMUM CLEARANCE OF 2 METRES HAS BEEN PROVIDED BETWEEN THE EDGE OF THE EFFLUENT DISPOSAL AREA AND THE PROPERTY BOUNDARIES AND THE NEW COTTAGE.

2.8 PHOTOGRAPHS

PHOTOS OF EFFLUENT DISPOSAL AREA AND TEST HOLE SHOWING SUBSURFACE MATERIALS OF TOPSOIL AND SILTY LOAM INCLUDED WITH REPORT FOR ORIGINAL GREYWATER SYSTEM DATED 8 MARCH 2005. COPY ATTACHED TO THIS EVALUATION.

3. SOIL INVESTIGATION

3.1 SOIL PROFILE DETERMINATION

SOIL PROFILE DETERMINED BY TEST PIT IN JANUARY 2005 AND REPORTING ON SOIL PROFILE BY DRAINLAYER M WARBURTON DURING EXCAVATIONS FOR SEPTIC TANK AND SOAKAGE TRENCH IN AUTUMN 2005.

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Richard Wells